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(54) Title: CNGH0004 POLYPEPTIDES, ANTIBODIES, COMPOSITIONS, METHODS AND USES

(57) Abstract: The present invention relates to at least one novel CNGH0004 polypeptides, antibodies, including isolated nucleic acids that encode at least one CNGH0004 polypeptide or antibody, CNGH0004 vectors, host cells, transgenic animals or plants, and methods of making and using thereof, including therapeutic compositions, methods and devices.

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**CNGH0004 POLYPEPTIDES, ANTIBODIES,
COMPOSITIONS, METHODS AND USES**

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

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The present invention relates to at least one CNGH0004 polypeptide or fragment thereof, and antibodies and anti-idiotypic antibodies specific therefore, as well as nucleic acids encoding such CNGH0004 polypeptides, fragments, antibodies, complementary nucleic acids, vectors, host cells, and methods of making and using thereof, including therapeutic formulations, administration and devices.

15 RELATED ART

Psoriasis is a genetic, multifactorial, chronic inflammatory skin disease, with a prevalence of 2.6% of the US population. The disease is characterized by pronounced hyperproliferation of keratinocytes, which results in rapid epidermal turnover and thickened, scaly, red plaques observed clinically. Other prominent histopathological features of the disease are alterations of cytokine production, fibroblast activation, vascular expansion, and leukocyte infiltration in the dermis and epidermis. Dysregulation in cytokine production from both activated cells in the dermis and the immune cells seems to play an important role in mediating the inflammatory events associated with psoriasis. To this end, a number of changes in gene and/or protein expression have been described previously in psoriasis and some of these genes and/or proteins have also been found to be associated with other inflammatory diseases. These include proinflammatory cytokines such as IL-1 and TNF α , adhesion molecules such as intercellular adhesion molecule 1 (ICAM1) and vascular adhesion molecule 1 (VCAM1), chemokines, and defensins. Recently, gene expression microarray technology has been applied to profile gene expression patterns in normal versus psoriatic lesional skins on a more inclusive scale and has provided new insights to the pathogenesis of psoriasis.

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cDNA microarray technology provides a format for the simultaneous measurement of the expression level of thousands of genes in a single hybridization assay. It is also amenable to an automated, high-throughput format. More importantly, microarray technology can be used to discover new genes, quantify and analyze gene expression and assign functionality to genes with unknown function. With the complete sequencing of human genome, identification and cloning of new genes is now accomplished rapidly. However, to understand whether these genes encode new proteins or to further identify function of these new proteins has not been advanced as rapidly. The impediment has become one of the main reasons for the use of high throughput cDNA microarray technology in a well-

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5 designed experimental setting to discover novel protein-encoding genes or genes with novel function that may subsequently become potential therapeutic targets for a variety of human diseases.

Accordingly, there is a need to provide CNGH0004 polypeptides or antibodies or fragments that overcome one or more of these problems, as well as improvements over known polypeptides or antibodies or fragments thereof.

10 SUMMARY OF THE INVENTION

This invention discloses the discovery of a novel CNGH0004 gene and polypeptides through data analysis of the microarray gene expression profiling in psoriatic lesional skin biopsy samples obtained from infliximab (REMICADE[®], an anti-TNF α monoclonal antibody approved to treat rheumatoid arthritis and Crohn's disease) treated versus placebo treated patients. The invention sets forth
15 sequences coding for a gene designated CNGH0004, and presents evidence for said gene the roles of a developmental and tissue remodeling regulator and as a tumor specific marker. Said sequences include nucleic acid sequences of full-length cDNA, open reading frames (ORFs), probes (e.g. for PCR), antisense, ribozymes, and vectors containing the sequences and the polypeptides encoded by them.

Compositions and methods for the therapy and diagnosis of, as non-limiting examples,
20 psoriasis, rheumatoid arthritis, Crohn's disease, asthma, and cancer, as well as other CNGH0004 related diseases and disorders, as described herein or as known in the art. Compositions may comprise one or more protein isoforms, immunogenic portions thereof, or polynucleotides that encode such portions. Alternatively, a therapeutic composition may comprise an antigen presenting cell that expresses CNGH0004 protein, or a T cell that is specific for cells expressing a polypeptide encoded by
25 the gene. Such compositions may be used, for example, for the prevention and treatment of diseases such as psoriasis, asthma, and brain-, colon-, skin- and/or breast cancer. Diagnostic and prognostic methods based on detecting CNGH0004 protein, or mRNA encoding such a protein, in a sample are also disclosed.

The present invention provides isolated CNGH0004 polypeptides and encoding nucleic acid, as
30 well as CNGH0004 human, primate, rodent, mammalian, chimeric, or human CNGH0004 polypeptides, antibodies, immunoglobulins, cleavage products and other specified portions and variants thereof, as well as CNGH0004 polypeptide or antibody compositions, encoding or complementary nucleic acids, vectors, host cells, compositions, formulations, devices, transgenic animals, transgenic plants, and methods of making and using thereof, as described and enabled herein, in combination with
35 what is known in the art.

The present invention also provides at least one isolated CNGH0004 antibody as described herein. An antibody according to the present invention can include any polypeptide or peptide

5 containing molecule that comprises at least a portion of an immunoglobulin molecule, such as but not limited to at least one complementarity determining region (CDR) (also termed the hypervariable region or HV) of a heavy or light chain variable region, or a ligand binding portion thereof, a heavy chain or light chain variable region, a heavy chain or light chain constant region, a framework region, or any portion thereof, wherein the antibody can be incorporated into an antibody of the present invention. An antibody of the invention can include or be derived from any mammal, such as but not limited to a human, a mouse, a rabbit, a rat, a rodent, a primate, or any combination thereof, and the like.

The present invention provides, in one aspect, isolated nucleic acid molecules comprising, complementary, or hybridizing to, a polynucleotide encoding specific CNGH0004 polypeptides or antibodies, comprising at least one specified sequence, domain, portion or variant thereof. The present invention further provides recombinant vectors comprising at least one if said CNGH0004 polypeptide or antibody encoding or complementary nucleic acid molecules, host cells containing such nucleic acids and/or recombinant vectors, as well as methods of making and/or using such antibody nucleic acids, vectors and/or host cells.

20 At least one antibody of the invention binds at least one specified epitope specific to at least one CNGH0004 polypeptide, subunit, fragment, portion or any combination thereof. The at least one epitope can comprise at least one antibody binding region that comprises at least one portion of said polypeptide, which epitope is preferably comprised of at least 1-5 amino acids of at least one portion thereof, such as but not limited to, at least one functional, extracellular, soluble, hydrophilic, external or cytoplasmic domain of said polypeptide, or any portion thereof.

25 The at least one antibody can optionally comprise at least one specified portion of at least one complementarity determining region (CDR) (e.g., CDR1, CDR2 or CDR3 of the heavy or light chain variable region) and optionally at least one constant or variable framework region or any portion thereof. The at least one antibody amino acid sequence can further optionally comprise at least one specified substitution, insertion or deletion as described herein or as known in the art.

30 The present invention also provides at least one isolated CNGH0004 polypeptide or antibody as described herein, wherein the antibody has at least one activity. An CNGH0004 polypeptide antibody can thus be screened for a corresponding activity according to known methods, such as but not limited to, at least one biological activity towards a CNGH0004 polypeptide or polypeptide related function.

35 The present invention further provides at least one CNGH0004 anti-idiotypic antibody to at least one CNGH0004 antibody of the present invention. The anti-idiotypic antibody includes any

5 polypeptide or peptide containing molecule that comprises at least a portion of an immunoglobulin molecule, such as but not limited to at least one complementarity determining region (CDR) of a heavy or light chain or a ligand binding portion thereof, a heavy chain or light chain variable region, a heavy chain or light chain constant region, a framework region, or any portion thereof, that can be incorporated into an antibody of the present invention. An antibody of the invention can include or be derived from any mammal, such as but not limited to a human, a mouse, a rabbit, a rat, a rodent, a primate, and the like. The present invention provides, in one aspect, isolated nucleic acid molecules comprising, complementary, or hybridizing to, a polynucleotide encoding at least one CNGH0004 anti-idiotype antibody, comprising at least one specified sequence, domain, portion or variant thereof. The present invention further provides recombinant vectors comprising said CNGH0004 anti-idiotype antibody encoding nucleic acid molecules, host cells containing such nucleic acids and/or recombinant vectors, as well as methods of making and/or using such anti-idiotype antibody nucleic acids, vectors and/or host cells.

The present invention also provides at least one method for expressing at least one CNGH0004 polypeptide or antibody, or CNGH0004 anti-idiotype antibody, in a host cell, comprising culturing a host cell as described herein under conditions wherein at least one CNGH0004 antibody is expressed in detectable and/or recoverable amounts.

The present invention also provides at least one composition comprising (a) an isolated CNGH0004 polypeptide or antibody encoding nucleic acid and/or polypeptide or antibody as described herein; and (b) a suitable carrier or diluent. The carrier or diluent can optionally be pharmaceutically acceptable, such as but not limited to known carriers or diluents. The composition can optionally further comprise at least one further compound, polypeptide or composition.

The present invention further provides at least one CNGH0004 polypeptide or antibody method or composition, for administering a therapeutically effective amount to modulate or treat at least one CNGH0004 related condition in a cell, tissue, organ, animal or patient and/or, prior to, subsequent to, or during a related condition, as known in the art and/or as described herein.

The present invention also provides at least one composition, device and/or method of delivery of a therapeutically or prophylactically effective amount of at least one CNGH0004 polypeptide or antibody, according to the present invention.

The present invention further provides at least one CNGH0004 polypeptide or antibody method or composition, for diagnosing at least one CNGH0004 related condition in a cell, tissue, organ, animal or patient and/or, prior to, subsequent to, or during a related condition, as known in the art and/or as described herein.

5 The present invention also provides at least one composition, device and/or method of delivery for diagnosing of at least one CNGH0004 polypeptide or antibody, according to the present invention.

 In another aspect, the present invention provides at least one isolated mammalian CNGH0004 polypeptide, comprising the amino acid sequences as part of SEQ ID NO:1.

 Also provided is an isolated nucleic acid encoding at least one isolated mammalian
10 CNGH0004 polypeptide; an isolated nucleic acid vector comprising the isolated nucleic acid, and/or a prokaryotic or eukaryotic host cell comprising the isolated nucleic acid. The host cell can optionally be at least one selected from prokaryotic or eukaryotic cells, or fusion cells thereof, e.g., but not limited to, mammalian, plant or insect, such as but not limited to, CHO, myeloma, or lymphoma cells, bacterial cells, yeast cells, silk worm cells, or any derivative, immortalized or transformed cell thereof. Also
15 provided is a method for producing at least one CNGH0004 polypeptide, comprising translating the polypeptide encoding nucleic acid under conditions in vitro, in vivo or in situ, such that the CNGH0004 polypeptide is expressed in detectable or recoverable amounts.

 Also provided is a composition comprising at least one isolated mammalian CNGH0004 polypeptide and at least one pharmaceutically acceptable carrier or diluent. The composition can
20 optionally further comprise an effective amount of at least one compound or polypeptide selected from at least one of a detectable label or reporter, an anti-infective drug, a cardiovascular (CV) system drug, a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a
25 topical drug, a nutritional drug or the like, a TNF antagonist, an antirheumatic, a muscle relaxant, a narcotic, a non-steroid inflammatory drug (NSAID), an analgesic, an anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial, an antipsoriatic, a corticosteroid, an anabolic steroid, an erythropoietin, an immunization, an immunoglobulin, an immunosuppressive, a growth hormone, a hormone replacement drug, a radiopharmaceutical, an antidepressant, an antipsychotic, a
30 stimulant, an asthma medication, a beta agonist, an inhaled steroid, an epinephrine or analog, a cytokine, or a cytokine antagonist.

 Also provided is a method for diagnosing or treating a CNGH0004 related condition in a cell, tissue, organ or animal, comprising

 (a) contacting or administering a composition comprising an effective amount of at least one
35 isolated mammalian CNGH0004 polypeptide of the invention with, or to, the cell, tissue, organ or animal. The method can optionally further comprise using an effective amount of 0.0000001-500 mg/kilogram per: 1-24 hours, 1-7 days, 1-52 weeks, 1-24 months, 1-30 years (or any range or value

5 therein), of the cells, tissue, organ or animal. The method can optionally further comprise using the contacting or the administering by at least one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolonic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal. The method can optionally further comprise administering, prior, concurrently or after the (a) contacting or administering, at least one composition comprising an effective amount of at least one compound or protein selected from at least one of an anti-infective drug, a cardiovascular (CV) system drug, a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a nutritional drug or the like. The method can optionally further comprise administering, prior, concurrently or after the (a) contacting or administering, at least one composition comprising an effective amount of at least one compound or polypeptide selected from at least one of a detectable label or reporter, a TNF antagonist, an antirheumatic, a muscle relaxant, a narcotic, an anti-inflammatory, a non-steroid inflammatory drug (NSAID), an analgesic, an anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial, an antipsoriatic, a corticosteroid, an anabolic steroid, an erythropoietin, an immunization, an immunoglobulin, an immunosuppressive, a hormone, a hormone replacement drug, a radiopharmaceutical, an antidepressant, an antipsychotic, a stimulant, an asthma medication, a beta agonist, an inhaled steroid, an epinephrine or analog, a cytokine, or a cytokine antagonist.

Also provided is at least one medical device, comprising at least one isolated mammalian CNGH0004 polypeptide of the invention, wherein the device is suitable to contacting or administering the at least one CNGH0004 polypeptide by at least one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolonic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal.

Also provided is an article of manufacture for human pharmaceutical or diagnostic use,

5 comprising packaging material and a container comprising a solution or a lyophilized form of at least one isolated mammalian CNGH0004 polypeptide of the present invention. The article of manufacture can optionally comprise having the container as a component of a parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolic, 10 intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal delivery device or system.

Also provided is a method for producing at least one isolated mammalian CNGH0004 15 polypeptide of the present invention, comprising providing a host cell or transgenic animal or transgenic plant or plant cell capable of expressing in recoverable amounts the polypeptide. Further provided in the present invention is at least one CNGH0004 polypeptide produced by the above method.

In another aspect the present invention provides at least one isolated mammalian CNGH0004 20 antibody, comprising at least one human CDR, wherein the antibody specifically binds at least one epitope comprising at least 1-3, to the entire amino acid sequence of SEQ ID NO:1.

The at least one antibody can optionally further comprise at least one characteristic selected from: (i) bind CNGH0004 with an affinity of at least one selected from at least 10^{-9} M, at least 10^{-10} M, at least 10^{-11} M, or at least 10^{-12} M; and/or (ii) substantially neutralizes at least one activity of at least 25 one CNGH0004 polypeptide. Also provided is an isolated nucleic acid encoding at least one isolated mammalian CNGH0004 antibody; an isolated nucleic acid vector comprising the isolated nucleic acid, and/or a prokaryotic or eukaryotic host cell comprising the isolated nucleic acid. The host cell can optionally be at least one selected from prokaryotic or eukaryotic cells, or fusion cells thereof, e.g., but not limited to, mammalian, plant or insect, such as but not limited to, CHO, myeloma, or lymphoma 30 cells, bacterial cells, yeast cells, silk worm cells, or any derivative, immortalized or transformed cell thereof. Also provided is a method for producing at least one CNGH0004 antibody, comprising translating the antibody encoding nucleic acid under conditions in vitro, in vivo or in situ, such that the CNGH0004 antibody is expressed in detectable or recoverable amounts.

Also provided is a composition comprising at least one isolated mammalian CNGH0004 35 antibody and at least one pharmaceutically acceptable carrier or diluent. The composition can optionally further comprise an effective amount of at least one compound or polypeptide selected from at least one of a detectable label or reporter, an anti-infective drug, a cardiovascular (CV) system drug,

5 a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a nutritional drug, a TNF antagonist, an antirheumatic, a muscle relaxant, a narcotic, a non-steroid inflammatory drug (NSAID), an analgesic, an anesthetic, a sedative, a local anesthetic, a
10 neuromuscular blocker, an antimicrobial, an antipsoriatic, a corticosteroid, an anabolic steroid, an erythropoietin, an immunization, an immunoglobulin, an immunosuppressive, a growth hormone, a hormone replacement drug, a radiopharmaceutical, an antidepressant, an antipsychotic, a stimulant, an asthma medication, a beta agonist, an inhaled steroid, an epinephrine or analog, a cytokine, or a cytokine antagonist.

15 The present invention further provides an anti-idiotypic antibody or fragment that specifically binds at least one isolated mammalian CNGH0004 antibody of the present invention.

Also provided is a method for diagnosing or treating a CNGH0004 related condition in a cell, tissue, organ or animal, comprising

(a) contacting or administering a composition comprising an effective amount of at least one
20 isolated mammalian CNGH0004 antibody of the invention with, or to, the cell, tissue, organ or animal. The method can optionally further comprise using an effective amount of 0.0001-500 mg/kilogram of the cells, tissue, organ or animal. The method can optionally further comprise using the contacting or the administering by at least one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular,
25 intracartilaginous, intracavitary, intracelular, intracerebellar, intracerebroventricular, intracolic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal.

30 The method can optionally further comprise administering, prior, concurrently or after the (a) contacting or administering, at least one composition comprising an effective amount of at least one compound or polypeptide selected from at least one of an anti-infective drug, a cardiovascular (CV) system drug, a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte
35 balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a nutritional drug or the like. The method can optionally further comprise administering, prior, concurrently or after the (a) contacting or administering, at least one composition.

5 comprising an effective amount of at least one compound or protein selected from at least one of a detectable label or reporter, a TNF antagonist, an antirheumatic, a muscle relaxant, a narcotic, an anti-inflammatory, a non-steroid inflammatory drug (NTHE), an analgesic, an anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial, an antipsoriatic, a corticosteroid, an anabolic steroid, an erythropoietin, an immunization, an immunoglobulin, an immunosuppressive, a hormone, a hormone replacement drug, a radiopharmaceutical, an antidepressant, an antipsychotic, a stimulant, an asthma medication, a beta agonist, an inhaled steroid, an epinephrine or analog, a cytokine, or a cytokine antagonist.

Also provided is at least one medical device, comprising at least one isolated mammalian CNGH0004 antibody of the invention, wherein the device is suitable to contacting or administering the at least one CNGH0004 antibody by at least one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal.

Also provided is an article of manufacture for human pharmaceutical or diagnostic use, comprising packaging material and a container comprising a solution or a lyophilized form of at least one isolated mammalian CNGH0004 antibody of the present invention. The article of manufacture can optionally comprise having the container as a component of a parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal delivery device or system.

Also provided is a method for producing at least one isolated mammalian CNGH0004 antibody of the present invention, comprising providing a host cell or transgenic animal or transgenic plant or plant cell capable of expressing in recoverable amounts the antibody. Further provided in the present invention is at least one CNGH0004 antibody produced by the above method.

The present invention further provides any invention described herein.

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DESCRIPTION OF THE INVENTION

The present invention provides isolated, recombinant and/or synthetic human CNGH0004 protein, as well as human, primate, rodent, mammalian, chimeric, humanized or CDR-grafted, antibodies and CNGH0004 anti-idiotypic antibodies thereto, and compositions and encoding nucleic acid molecules comprising at least one polynucleotide encoding at least one CNGH0004 protein, antibody or anti-idiotypic antibody. The present invention further includes, but is not limited to, methods of making and using such nucleic acids and antibodies and anti-idiotypic antibodies, including diagnostic and therapeutic compositions, methods and devices.

As used herein, an "CNGH0004 antibody," "CNGH0004 antibody," and the like include any polypeptide or peptide containing molecule that comprises at least a portion of an immunoglobulin molecule, such as but not limited to at least one complementarity determining region (CDR) of a heavy or light chain or a ligand binding portion thereof, a heavy chain or light chain variable region, a heavy chain or light chain constant region, a framework region, or any portion, fragment or variant thereof, or at least one portion of an CNGH0004 receptor or binding polypeptide, which can be incorporated into a CNGH0004 antibody of the present invention.

Antibodies can include one or more of at least one CDR, at least one variable region, at least one constant region, at least one heavy chain (e.g., γ_1 , γ_2 , γ_3 , γ_4 , μ , α_1 , α_2 , δ , ϵ), at least one light chain (e.g., κ and λ), or any portion or fragment thereof, and can further comprise interchain and intrachain disulfide bonds, hinge regions, glycosylation sites that can be separated by a hinge region, as well as heavy chains and light chains. Light chains typically have a molecular weight of about 25Kd and heavy chains typically range from 50K-77Kd. Light chains can exist in two distinct forms or isotypes, kappa (κ) and lambda (λ), which can combine with any of the heavy chain types. All light chains have at least one variable region and at least one constant region. The IgG antibody is considered a typical antibody structure and has two intrachain disulfide bonds in the light chain (one in variable region and one in the constant region), with four in the heavy chain, and such bond encompassing a peptide loop of about 60-70 amino acids comprising a "domain" of about 110 amino acids in the chain. IgG antibodies can be characterized into four classes, IgG1, IgG2, IgG3 and IgG4. Each immunoglobulin class has a different set of functions. The following table summarizes the Physicochemical properties of each of the immunoglobulin classes and subclasses.

| Property | IgG1 | IgG2 | IgG3 | IgG4 | IgM | IgA1 | IgA2 | SIgA | IgD | IgE |
|--------------------------|------------|------------|------------|------------|-------|------------|------------|-----------------------|----------|---------|
| Heavy Chain | γ_1 | γ_1 | γ_1 | γ_1 | μ | α_1 | α_2 | α_1 / α_2 | δ | e |
| Mean Serum conc. (mg/ml) | 9 | 3 | 1 | 0.5 | 1.5 | 3.0 | 0.5 | 0.05 | 0.03 | 0.00005 |

| | | | | | | | | | | |
|------------------------------|-----|-----|-----|-----|-----|------|------|-------|------|-----|
| Sedimentation constant | 7s | 7s | 7s | 7s | 19s | 7s | 7s | 11s | 7s | 8s |
| Mol. Wt. ($\times 10^3$) | 146 | 146 | 170 | 146 | 970 | 160 | 160 | 385 | 184 | 188 |
| Half Life (days) | 21 | 20 | 7 | 21 | 10 | 6 | 6 | ? | 3 | 2 |
| % intravascular distribution | 45 | 45 | 45 | 45 | 80 | 42 | 42 | Trace | 75 | 50 |
| Carbohydrate (%) | 2-3 | 2-3 | 2-3 | 2-3 | 12 | 7-11 | 7-11 | 7-11 | 9-14 | 12 |

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The following table summarizes non-limiting examples of antibody effector functions for human antibody classes and subclasses.

| Effector function | IgG1 | IgG2 | IgG3 | IgG4 | IgM | IgA | IgD | IgE |
|---------------------|------|------|------|------|-----|-----|-----|-----|
| Complement fixation | ++ | + | +++ | - | +++ | - | - | - |
| Placental transfer | + | + | + | + | - | - | - | - |
| Binding to Staph A | +++ | +++ | - | +++ | - | - | - | - |
| Binding to Strep G | +++ | +++ | +++ | +++ | - | - | - | - |

10 Accordingly, the type of antibody or fragment thereof can be selected for use according to the present invention based on the desired characteristics and functions that are desired for a particular therapeutic or diagnostic use, such as but not limited to serum half life, intravascular distribution, complement fixation, etc.

15 Antibody diversity is generated by at least 5 mechanisms, including (1) the use of multiple genes encoding parts of the antibody; (2) somatic mutation, e.g., primordial V gene mutation during B-cell ontogeny to produce different V genes in different B-cell clones; (3) somatic recombination, e.g., gene segments J1-Jn recombine to join the main part of the V-region gene during B-cell ontogeny; (4) gene conversion where sections of DNA from a number of pseudo V region can be copied into the V region to alter the DNA sequence; and (5) nucleotide addition, e.g., when V and J regions are cut, before joining, and extra nucleotides may be inserted to code for additional amino acids. Non-limiting 20 examples include, but are not limited to, (i) the selection/recombination of V κ , J, and C κ regions from germ line to B-cell clones to generate kappa chains; (ii) selection/recombination of V λ , J, and C λ regions from germ line to B-cell clones to generate lambda chains; (iii) selection/recombination of V_H, D1-D30 and J_H1-J_H6 genes to form a functional VDJ gene encoding a heavy chain variable region. The above mechanisms work in a coordinated fashion to generate antibody diversity and specificity.

25 The term "antibody" is further intended to encompass antibodies, digestion fragments, specified portions and variants thereof, including antibody mimetics or comprising portions of antibodies that mimic the structure and/or function of an antibody or specified fragment or portion thereof, including single chain antibodies and fragments thereof. Functional fragments include antigen-binding fragments that bind to a mammalian CNGH0004. For example, antibody fragments

5 capable of binding to CNGH0004 or portions thereof, including, but not limited to Fab (e.g., by papain digestion), Fab' (e.g., by pepsin digestion and partial reduction) and F(ab')₂ (e.g., by pepsin digestion),
10 facb (e.g., by plasmin digestion), pFc' (e.g., by pepsin or plasmin digestion), Fd (e.g., by pepsin digestion, partial reduction and reaggregation), Fv or scFv (e.g., by molecular biology techniques) fragments, are encompassed by the invention (see, e.g., Colligan, et al., eds., Current Protocols in Immunology, John Wiley & Sons, Inc., NY (1994-2001)).

Such fragments can be produced by enzymatic cleavage, synthetic or recombinant techniques, as known in the art and/or as described herein. Antibodies can also be produced in a variety of truncated forms using antibody genes in which one or more stop codons have been introduced upstream of the natural stop site. For example, a combination gene encoding a F(ab')₂ heavy chain portion can
15 be designed to include DNA sequences encoding the CH₁ domain and/or hinge region of the heavy chain. The various portions of antibodies can be joined together chemically by conventional techniques, or can be prepared as a contiguous polypeptide using genetic engineering techniques.

As used herein, the term "human antibody" refers to an antibody in which substantially every part of the polypeptide (e.g., CDR, framework, C_L, C_H domains (e.g., C_{H1}, C_{H2}, C_{H3}), hinge, (V_L, V_H))
20 is substantially non-immunogenic in humans, with only minor sequence changes or variations. Similarly, antibodies designated primate (monkey, baboon, chimpanzee, etc.), rodent (mouse, rat, rabbit, guinea pig, hamster, and the like) and other mammals designate such species, sub-genus, genus, sub-family, family specific antibodies. Further, chimeric antibodies include any combination of the above. Such changes or variations optionally and preferably retain or reduce the immunogenicity in
25 humans or other species relative to non-modified antibodies. Thus, a human antibody is distinct from a chimeric or humanized antibody. It is pointed out that a human antibody can be produced by a non-human animal or prokaryotic or eukaryotic cell that is capable of expressing functionally rearranged human immunoglobulin (e.g., heavy chain and/or light chain) genes. Further, when a human antibody is a single chain antibody, it can comprise a linker peptide that is not found in native human antibodies.
30 For example, an Fv can comprise a linker peptide, such as two to about eight glycine or other amino acid residues, which connects the variable region of the heavy chain and the variable region of the light chain. Such linker peptides are considered to be of human origin.

Bispecific, heterospecific, heteroconjugate or similar antibodies can also be used that are monoclonal, preferably human or humanized, antibodies that have binding specificities for at least two
35 different antigens. In the present case, one of the binding specificities is for at least one CNGH0004 polypeptide, the other one is for any other antigen. Methods for making bispecific antibodies are known in the art. Traditionally, the recombinant production of bispecific antibodies is based on the co-

5 expression of two immunoglobulin heavy chain-light chain pairs, where the two heavy chains have different specificities (Milstein and Cuello, Nature 305:537 (1983)). Because of the random assortment of immunoglobulin heavy and light chains, these hybridomas (quadromas) produce a potential mixture of 10 different antibody molecules, of which only one has the correct bispecific structure. The purification of the correct molecule, which is usually done by affinity chromatography steps, is rather
10 cumbersome, and the product yields are low. Similar procedures are disclosed, e.g., in WO 93/08829, US Patent Nos, 6210668, 6193967, 6132992, 6106833, 6060285, 6037453, 6010902, 5989530, 5959084, 5959083, 5932448, 5833985, 5821333, 5807706, 5643759, 5601819, 5582996, 5496549, 4676980, WO 91/00360, WO 92/00373, EP 03089, Traunecker et al., EMBO J. 10:3655 (1991), Suresh et al., Methods in Enzymology 121:210 (1986), each entirely incorporated herein by reference.

15 Such antibodies optionally further affect a specific ligand, such as but not limited to where such antibody modulates, decreases, increases, antagonizes, antagonizes, mitigates, alleviates, blocks, inhibits, abrogates and/or interferes with at least one CNGH0004 activity or binding, or with CNGH0004 receptor activity or binding, *in vitro*, *in situ* and/or *in vivo*. As a non-limiting example, a suitable CNGH0004 antibody, specified portion or variant of the present invention can bind at least one
20 CNGH0004, or specified portions, variants or domains thereof. A suitable CNGH0004 antibody, specified portion, or variant can also optionally affect at least one of CNGH0004 activity or function, such as but not limited to, RNA, DNA or polypeptide synthesis, CNGH0004 release, CNGH0004 receptor signaling, membrane CNGH0004 cleavage, CNGH0004 activity, CNGH0004 production and/or synthesis.

25 CNGH0004 antibodies (also termed CNGH0004 antibodies) useful in the methods and compositions of the present invention can optionally be characterized by high affinity binding to CNGH0004 and optionally and preferably having low toxicity. In particular, an antibody, specified fragment or variant of the invention, where the individual components, such as the variable region, constant region and framework, individually and/or collectively, optionally and preferably possess low
30 immunogenicity, is useful in the present invention. The antibodies that can be used in the invention are optionally characterized by their ability to treat patients for extended periods with measurable alleviation of symptoms and low and/or acceptable toxicity. Low or acceptable immunogenicity and/or high affinity, as well as other suitable properties, can contribute to the therapeutic results achieved. "Low immunogenicity" is defined herein as raising significant HAHA, HACA or HAMA responses in
35 less than about 75%, or preferably less than about 50% of the patients treated and/or raising low titres in the patient treated (less than about 300, preferably less than about 100 measured with a double

5 antigen-enzyme immunoassay) (Elliott *et al.*, *Lancet* 344:1125-1127 (1994), entirely incorporated herein by reference).

Utility

CNGH0004 protein is predicted to be an extracellular matrix protein. All CNGH0004 protein domains are characterized as extracellular domains. In addition to normal placenta and fetal tissue
10 development, protein domains that constitute CNGH0004 are probably also involved in tissue remodeling of airway smooth muscle as well as psoriatic epithelium. Based on its domain structure, CNGH0004 may function through mediating adhesion via metal ion-dependent adhesion sites (MDAS), or via modulating complement control related to immunological responses. As such, CNGH0004 is a potential therapeutic target for treatment of autoimmune or chronic inflammatory
15 diseases including, but not limited to psoriasis or asthma, and different types of cancers.

The isolated nucleic acids of the present invention can be used for production of at least one CNGH0004 antibody or specified variant thereof, which can be used to measure or effect in an cell, tissue, organ or animal (including mammals and humans), to diagnose, monitor, modulate, treat, alleviate, help prevent the incidence of, or reduce the symptoms of, at least one CNGH0004 condition,
20 selected from, but not limited to, at least one of an immune disorder or disease, a cardiovascular disorder or disease, an infectious, malignant, and/or neurologic disorder or disease, or other known or specified CNGH0004 related condition.

Such a method can comprise administering an effective amount of a composition or a pharmaceutical composition comprising at least one CNGH0004 antibody to a cell, tissue, organ,
25 animal or patient in need of such modulation, treatment, alleviation, prevention, or reduction in symptoms, effects or mechanisms. The effective amount can comprise an amount of about 0.001 to 500 mg/kg per single (e.g., bolus), multiple or continuous administration, or to achieve a serum concentration of 0.01-5000 µg/ml serum concentration per single, multiple, or continuous administration, or any effective range or value therein, as done and determined using known methods,
30 as described herein or known in the relevant arts.

Citations

All publications or patents cited herein are entirely incorporated herein by reference as they show the state of the art at the time of the present invention and/or to provide description and enablement of the present invention. Publications refer to any scientific or patent publications, or any
35 other information available in any media format, including all recorded, electronic or printed formats. The following references are entirely incorporated herein by reference: Ausubel, et al., ed., *Current Protocols in Molecular Biology*, John Wiley & Sons, Inc., NY, NY (1987-2001); Sambrook, et al., *Molecular Cloning: A Laboratory Manual*, 2nd Edition, Cold Spring Harbor, NY (1989); Harlow and

5 Lane, antibodies, a Laboratory Manual, Cold Spring Harbor, NY (1989); Colligan, et al., eds., Current Protocols in Immunology, John Wiley & Sons, Inc., NY (1994-2001); Colligan et al., Current Protocols in Polypeptide Science, John Wiley & Sons, NY, NY, (1997-2001).

Antibodies of the Present Invention

10 At least one CNGH0004 antibody of the present invention can be optionally produced by a cell line, a mixed cell line, an immortalized cell or clonal population of immortalized cells, as well known in the art. See, e.g., Ausubel, et al., ed., Current Protocols in Molecular Biology, John Wiley & Sons, Inc., NY, NY (1987-2001); Sambrook, et al., Molecular Cloning: A Laboratory Manual, 2nd Edition, Cold Spring Harbor, NY (1989); Harlow and Lane, antibodies, a Laboratory Manual, Cold Spring Harbor, NY (1989); Colligan, et al., eds., Current Protocols in Immunology, John Wiley & Sons, Inc., NY (1994-2001); Colligan et al., Current Protocols in Polypeptide Science, John Wiley & Sons, NY, NY, (1997-2001), each entirely incorporated herein by reference.

15 Human antibodies that are specific for human CNGH0004 polypeptides or fragments thereof can be raised against an appropriate immunogenic antigen, such as isolated and/or CNGH0004 polypeptide or a portion thereof (including synthetic molecules, such as synthetic peptides). Other specific or general mammalian antibodies can be similarly raised. Preparation of immunogenic antigens, and monoclonal antibody production can be performed using any suitable technique.

20 In one approach, a hybridoma is produced by fusing a suitable immortal cell line (e.g., a myeloma cell line such as, but not limited to, Sp2/0, Sp2/0-AG14, NSO, NS1, NS2, AE-1, L.5, >243, P3X63Ag8.653, Sp2 SA3, Sp2 MAI, Sp2 SS1, Sp2 SA5, U937, MLA 144, ACT IV, MOLT4, DA-1, 25 JURKAT, WEHI, K-562, COS, RAJI, NIH 3T3, HL-60, MLA 144, NAMAIWA, NEURO 2A, or the like, or heteromyelomas, fusion products thereof, or any cell or fusion cell derived therefrom, or any other suitable cell line as known in the art. See, e.g., www.atcc.org, www.lifetech.com, and the like, with antibody producing cells, such as, but not limited to, isolated or cloned spleen, peripheral blood, lymph, tonsil, or other immune or B cell containing cells, or any other cells expressing heavy or light 30 chain constant or variable or framework or CDR sequences, either as endogenous or heterologous nucleic acid, as recombinant or endogenous, viral, bacterial, algal, prokaryotic, amphibian, insect, reptilian, fish, mammalian, rodent, equine, ovine, goat, sheep, primate, eukaryotic, genomic DNA, cDNA, rDNA, mitochondrial DNA or RNA, chloroplast DNA or RNA, hnRNA, mRNA, tRNA, single, double or triple stranded, hybridized, and the like or any combination thereof. See, e.g., Ausubel, 35 supra, and Colligan, Immunology, supra, chapter 2, entirely incorporated herein by reference.

Antibody producing cells can also be obtained from the peripheral blood or, preferably the spleen or lymph nodes, of humans or other suitable animals that have been immunized with the antigen of interest. Any other suitable host cell can also be used for expressing heterologous or endogenous

5 nucleic acid encoding an antibody, specified fragment or variant thereof, of the present invention. The fused cells (hybridomas) or recombinant cells can be isolated using selective culture conditions or other suitable known methods, and cloned by limiting dilution or cell sorting, or other known methods. Cells which produce antibodies with the desired specificity can be selected by a suitable assay (e.g., ELISA).

10 Other suitable methods of producing or isolating antibodies of the requisite specificity can be used, including, but not limited to, methods that select recombinant antibody from a peptide or polypeptide library (e.g., but not limited to, a bacteriophage, ribosome, oligonucleotide, RNA, cDNA, or the like, display library; e.g., as available from Cambridge antibody Technologies, Cambridgeshire, UK; MorphoSys, Martinsreid/Planegg, DE; Biovation, Aberdeen, Scotland, UK; BioInvent, Lund, Sweden; Dyax Corp., Enzon, Affymax/Biosite; Xoma, Berkeley, CA; Ixsys. See, e.g., EP 368,684, PCT/GB91/01134; PCT/GB92/01755; PCT/GB92/002240; PCT/GB92/00883; PCT/GB93/00605; US 08/350260(5/12/94); PCT/GB94/01422; PCT/GB94/02662; PCT/GB97/01835; (CAT/MRC); WO90/14443; WO90/14424; WO90/14430; PCT/US94/1234; WO92/18619; WO96/07754; (Scripps); EP 614 989 (MorphoSys); WO95/16027 (BioInvent); WO88/06630; WO90/3809 (Dyax); US 20 4,704,692 (Enzon); PCT/US91/02989 (Affymax); WO89/06283; EP 371 998; EP 550 400; (Xoma); EP 229 046; PCT/US91/07149 (Ixsys); or stochastically generated peptides or polypeptides - US 5723323, 5763192, 5814476, 5817483, 5824514, 5976862, WO 86/05803, EP 590 689 (Ixsys, now Applied Molecular Evolution (AME), each entirely incorporated herein by reference) or that rely upon immunization of transgenic animals (e.g., SCID mice, Nguyen et al., *Microbiol. Immunol.* 41:901-907 25 (1997); Sandhu et al., *Crit. Rev. Biotechnol.* 16:95-118 (1996); Eren et al., *Immunol.* 93:154-161 (1998), each entirely incorporated by reference as well as related patents and applications) that are capable of producing a repertoire of human antibodies, as known in the art and/or as described herein. Such techniques, include, but are not limited to, ribosome display (Hanes et al., *Proc. Natl. Acad. Sci. USA*, 94:4937-4942 (May 1997); Hanes et al., *Proc. Natl. Acad. Sci. USA*, 95:14130-14135 (Nov. 30 1998)); single cell antibody producing technologies (e.g., selected lymphocyte antibody method ("SLAM") (US pat. No. 5,627,052, Wen et al., *J. Immunol.* 17:887-892 (1987); Babcook et al., *Proc. Natl. Acad. Sci. USA* 93:7843-7848 (1996)); gel microdroplet and flow cytometry (Powell et al., *Biotechnol.* 8:333-337 (1990); One Cell Systems, Cambridge, MA; Gray et al., *J. Imm. Meth.* 182:155-163 (1995); Kenny et al., *Bio/Technol.* 13:787-790 (1995)); B-cell selection (Steenbakkers et al., 35 *Molec. Biol. Reports* 19:125-134 (1994); Jonak et al., *Progress Biotech*, Vol. 5, *In Vitro Immunization in Hybridoma Technology*, Borrebaeck, ed., Elsevier Science Publishers B.V., Amsterdam, Netherlands (1988)).

5 Methods for engineering or humanizing non-human or human antibodies can also be used and are well known in the art. Generally, a humanized or engineered antibody has one or more amino acid residues from a source which is non-human, e.g., but not limited to mouse, rat, rabbit, non-human primate or other mammal. These human amino acid residues are often referred to as "import" residues, which are typically taken from an "import" variable, constant or other domain of a known human
10 sequence. Known human Ig sequences are disclosed, e.g., www.ncbi.nlm.nih.gov/entrez/query.fcgi;
www.atcc.org/phage/hdb.html; www.sciquest.com/; www.abcam.com/;
www.antibodyresource.com/onlinecomp.html; www.public.iastate.edu/~pedro/research_tools.html;
www.mgen.uni-heidelberg.de/SD/IT/IT.html; www.whfreeman.com/immunology/CH05/kuby05.htm;
www.library.thinkquest.org/12429/Immune/Antibody.html; www.hhmi.org/grants/lectures/1996/vlab/;
15 www.path.cam.ac.uk/~mrc7/mikeimages.html; www.antibodyresource.com/;
mcb.harvard.edu/BioLinks/Immunology.html. www.immunologylink.com/;
pathbox.wustl.edu/~hcenter/index.html; www.biotech.ufl.edu/~hcl/;
www.pebio.com/pa/340913/340913.html; www.nal.usda.gov/awic/pubs/antibody/;
www.m.ehime-u.ac.jp/~yasuhito/Elisa.html; www.biodesign.com/table.asp;
20 www.icnet.uk/axp/facs/davies/links.html; www.biotech.ufl.edu/~fccl/protocol.html; www.isac-net.org/sites_geo.html; aximt1.imt.uni-marburg.de/~rek/AEPStart.html;
baserv.uci.kun.nl/~jraats/links1.html; www.recab.uni-hd.de/immuno.bme.nwu.edu/; www.mrc-cpe.cam.ac.uk/imt-doc/public/INTRO.html; www.ibt.unam.mx/vir/V_mice.html; imgt.cnusc.fr:8104/;
www.biochem.ucl.ac.uk/~martin/abs/index.html; antibody.bath.ac.uk/;
25 abgen.cvm.tamu.edu/lab/wwwabgen.html; www.unizh.ch/~honegger/AHOseminar/Slide01.html;
www.cryst.bbk.ac.uk/~ubcg07s/; www.nimr.mrc.ac.uk/CC/ccaewg/ccaewg.htm;
www.path.cam.ac.uk/~mrc7/humanisation/TAHHP.html;
www.ibt.unam.mx/vir/structure/stat_aim.html; www.biosci.missouri.edu/smithgp/index.html;
www.cryst.bioc.cam.ac.uk/~finolina/Web-pages/Pept/spottech.html; www.jerini.de/fr_products.htm;
30 www.patents.ibm.com/ibm.html. Kabat et al., Sequences of Polypeptides of Immunological Interest, U.S. Dept. Health (1983), each entirely incorporated herein by reference.

Such imported sequences can be used to reduce immunogenicity or reduce, enhance or modify binding, affinity, on-rate, off-rate, avidity, specificity, half-life, or any other suitable characteristic, as known in the art. Generally part or all of the non-human or human CDR sequences are maintained
35 while the non-human sequences of the variable and constant regions are replaced with human or other amino acids. antibodies can also optionally be humanized with retention of high affinity for the antigen and other favorable biological properties. To achieve this goal, humanized antibodies can be

5 optionally prepared by a process of analysis of the parental sequences and various conceptual
humanized products using three-dimensional models of the parental and humanized sequences. Three-
dimensional immunoglobulin models are commonly available and are familiar to those skilled in the
art. Computer programs are available which illustrate and display probable three-dimensional
conformational structures of selected candidate immunoglobulin sequences. Inspection of these
10 displays permits analysis of the likely role of the residues in the functioning of the candidate
immunoglobulin sequence, i.e., the analysis of residues that influence the ability of the candidate
immunoglobulin to bind its antigen. In this way, framework residues can be selected and combined
from the consensus and import sequences so that the desired antibody characteristic, such as increased
affinity for the target antigen(s), is achieved. In general, the CDR residues are directly and most
15 substantially involved in influencing antigen binding. Humanization or engineering of antibodies of
the present invention can be performed using any known method, such as but not limited to those
described in, Winter (Jones et al., *Nature* 321:522 (1986); Riechmann et al., *Nature* 332:323 (1988);
Verhoeyen et al., *Science* 239:1534 (1988)), Sims et al., *J. Immunol.* 151: 2296 (1993); Chothia and
Lesk, *J. Mol. Biol.* 196:901 (1987), Carter et al., *Proc. Natl. Acad. Sci. U.S.A.* 89:4285 (1992); Presta
20 et al., *J. Immunol.* 151:2623 (1993), US patent Nos: 5723323, 5976862, 5824514, 5817483, 5814476,
5763192, 5723323, 5,766886, 5714352, 6204023, 6180370, 5693762, 5530101, 5585089, 5225539;
4816567, PCT/: US98/16280, US96/18978, US91/09630, US91/05939, US94/01234, GB89/01334,
GB91/01134, GB92/01755; WO90/14443, WO90/14424, WO90/14430, EP 229246, each entirely
incorporated herein by reference, included references cited therein.

25 The CNGH0004 antibody can also be optionally generated by immunization of a transgenic
animal (e.g., mouse, rat, hamster, non-human primate, and the like) capable of producing a repertoire
of human antibodies, as described herein and/or as known in the art. Cells that produce a human
CNGH0004 antibody can be isolated from such animals and immortalized using suitable methods, such
as the methods described herein and/or as known in the art.

30 Transgenic mice that can produce a repertoire of human antibodies that bind to human antigens
can be produced by known methods (e.g., but not limited to, U.S. Pat. Nos: 5,770,428, 5,569,825,
5,545,806, 5,625,126, 5,625,825, 5,633,425, 5,661,016 and 5,789,650 issued to Lonberg *et al.*;
Jakobovits *et al.* WO 98/50433, Jakobovits *et al.* WO 98/24893, Lonberg *et al.* WO 98/24884, Lonberg
et al. WO 97/13852, Lonberg *et al.* WO 94/25585, Kucherlapate *et al.* WO 96/34096, Kucherlapate *et*
35 *al.* EP 0463 151 B1, Kucherlapate *et al.* EP 0710 719 A1, Surani *et al.* US. Pat. No. 5,545,807,
Bruggemann *et al.* WO 90/04036, Bruggemann *et al.* EP 0438 474 B1, Lonberg *et al.* EP 0814 259 A2,
Lonberg *et al.* GB 2 272 440 A, Lonberg *et al.* *Nature* 368:856-859 (1994), Taylor *et al.*, *Int. Immunol.*

5 6(4)579-591 (1994), Green *et al.*, *Nature Genetics* 7:13-21 (1994), Mendez *et al.*, *Nature Genetics*
15:146-156 (1997), Taylor *et al.*, *Nucleic Acids Research* 20(23):6287-6295 (1992), Tuailon *et al.*,
Proc Natl Acad Sci USA 90(8)3720-3724 (1993), Lonberg *et al.*, *Int Rev Immunol* 13(1):65-93 (1995)
and Fishwald *et al.*, *Nat Biotechnol* 14(7):845-851 (1996), which are each entirely incorporated herein
10 by reference). Generally, these mice comprise at least one transgene comprising DNA from at least
one human immunoglobulin locus that is functionally rearranged, or which can undergo functional
rearrangement. The endogenous immunoglobulin loci in such mice can be disrupted or deleted to
eliminate the capacity of the animal to produce antibodies encoded by endogenous genes.

Screening antibodies for specific binding to similar polypeptides or fragments can be
conveniently achieved using peptide display libraries. This method involves the screening of large
15 collections of peptides for individual members having the desired function or structure. antibody
screening of peptide display libraries is well known in the art. The displayed peptide sequences can be
from 3 to 5000 or more amino acids in length, frequently from 5-100 amino acids long, and often from
about 8 to 25 amino acids long. In addition to direct chemical synthetic methods for generating peptide
libraries, several recombinant DNA methods have been described. One type involves the display of a
20 peptide sequence on the surface of a bacteriophage or cell. Each bacteriophage or cell contains the
nucleotide sequence encoding the particular displayed peptide sequence. Such methods are described in
PCT Patent Publication Nos. 91/17271, 91/18980, 91/19818, and 93/08278. Other systems for generating
libraries of peptides have aspects of both in vitro chemical synthesis and recombinant methods. See, PCT
Patent Publication Nos. 92/05258, 92/14843, and 96/19256. See also, U.S. Patent Nos. 5,658,754; and
25 5,643,768. Peptide display libraries, vector, and screening kits are commercially available from such
suppliers as Invitrogen (Carlsbad, CA), and Cambridge antibody Technologies (Cambridgeshire, UK).
See, e.g., U.S. Pat. Nos. 4704692, 4939666, 4946778, 5260203, 5455030, 5518889, 5534621, 5656730,
5763733, 5767260, 5856456, assigned to Enzon; 5223409, 5403484, 5571698, 5837500, assigned to
Dyax, 5427908, 5580717, assigned to Affymax; 5885793, assigned to Cambridge antibody Technologies;
30 5750373, assigned to Genentech, 5618920, 5595898, 5576195, 5698435, 5693493, 5698417, assigned to
Xoma, Colligan, *supra*; Ausubel, *supra*; or Sambrook, *supra*, each of the above patents and publications
entirely incorporated herein by reference.

Antibodies of the present invention can also be prepared using at least one CNGH0004
antibody encoding nucleic acid to provide transgenic animals or mammals, such as goats, cows, horses,
35 sheep, and the like, that produce such antibodies in their milk. Such animals can be provided using
known methods. See, e.g., but not limited to, US patent nos. 5,827,690; 5,849,992; 4,873,316;

5 5,849,992; 5,994,616; 5,565,362; 5,304,489, and the like, each of which is entirely incorporated herein by reference.

Antibodies of the present invention can additionally be prepared using at least one CNGH0004 antibody encoding nucleic acid to provide transgenic plants and cultured plant cells (e.g., but not limited to tobacco and maize) that produce such antibodies, specified portions or variants in the plant parts or in cells cultured therefrom. As a non-limiting example, transgenic tobacco leaves expressing recombinant polypeptides have been successfully used to provide large amounts of recombinant polypeptides, e.g., using an inducible promoter. See, e.g., Cramer et al., *Curr. Top. Microbol. Immunol.* 240:95-118 (1999) and references cited therein. Also, transgenic maize have been used to express mammalian polypeptides at commercial production levels, with biological activities equivalent to those produced in other recombinant systems or purified from natural sources. See, e.g., Hood et al., *Adv. Exp. Med. Biol.* 464:127-147 (1999) and references cited therein. antibodies have also been produced in large amounts from transgenic plant seeds including antibody fragments, such as single chain antibodies (scFv's), including tobacco seeds and potato tubers. See, e.g., Conrad et al., *Plant Mol. Biol.* 38:101-109 (1998) and reference cited therein. Thus, antibodies of the present invention can also be produced using transgenic plants, according to know methods. See also, e.g., Fischer et al., *Biotechnol. Appl. Biochem.* 30:99-108 (Oct., 1999), Ma et al., *Trends Biotechnol.* 13:522-7 (1995); Ma et al., *Plant Physiol.* 109:341-6 (1995); Whitelam et al., *Biochem. Soc. Trans.* 22:940-944 (1994); and references cited therein. Each of the above references is entirely incorporated herein by reference.

The antibodies of the invention can bind human CNGH0004 with a wide range of affinities (K_D). In a preferred embodiment, at least one human mAb of the present invention can optionally bind human CNGH0004 with high affinity. For example, a human mAb can bind human CNGH0004 with a K_D equal to or less than about 10^{-7} M, such as but not limited to, 0.1-9.9 (or any range or value therein) $\times 10^{-7}$, 10^{-8} , 10^{-9} , 10^{-10} , 10^{-11} , 10^{-12} , 10^{-13} or any range or value therein.

The affinity or avidity of an antibody for an antigen can be determined experimentally using any suitable method. (See, for example, Berzofsky, *et al.*, "Antibody-Antigen Interactions," In *Fundamental Immunology*, Paul, W. E., Ed., Raven Press: New York, NY (1984); Kuby, Janis *Immunology*, W. H. Freeman and Company: New York, NY (1992); and methods described herein). The measured affinity of a particular antibody-antigen interaction can vary if measured under different conditions (e.g., salt concentration, pH). Thus, measurements of affinity and other antigen-binding parameters (e.g., K_D , K_a , K_d) are preferably made with standardized solutions of antibody and antigen, and a standardized buffer, such as the buffer described herein.

Nucleic Acid Molecules

5 Using the information provided herein, such as the nucleotide sequences encoding at least 70-
100% of the contiguous amino acids of at least one of SEQ ID NO:1, specified fragments, variants or
consensus sequences thereof, or a deposited vector comprising at least one of these sequences, a
nucleic acid molecule of the present invention encoding at least one CNGH0004 antibody can be
obtained using methods described herein or as known in the art, such as but not limited to SEQ ID
10 NO:2.

Nucleic acid molecules of the present invention can be in the form of RNA, such as mRNA,
hnRNA, tRNA or any other form, or in the form of DNA, including, but not limited to, cDNA and
genomic DNA obtained by cloning or produced synthetically, or any combinations thereof. The DNA
can be triple-stranded, double-stranded or single-stranded, or any combination thereof. Any portion of
15 at least one strand of the DNA or RNA can be the coding strand, also known as the sense strand, or it
can be the non-coding strand, also referred to as the anti-sense strand.

Isolated nucleic acid molecules of the present invention can include nucleic acid molecules
comprising an open reading frame (ORF), optionally with one or more introns, e.g., but not limited to,
at least one specified portion of at least one CDR, as CDR1, CDR2 and/or CDR3 of at least one heavy
20 chain or light chain; nucleic acid molecules comprising the coding sequence for an CNGH0004
antibody or variable region; and nucleic acid molecules which comprise a nucleotide sequence
substantially different from those described above but which, due to the degeneracy of the genetic
code, still encode at least one CNGH0004 antibody as described herein and/or as known in the art. Of
course, the genetic code is well known in the art. Thus, it would be routine for one skilled in the art to
25 generate such degenerate nucleic acid variants that code for specific CNGH0004 antibodies of the
present invention. See, e.g., Ausubel, et al., *supra*, and such nucleic acid variants are included in the
present invention. Non-limiting examples of isolated nucleic acid molecules of the present invention
include the CDR sequences corresponding to non-limiting examples of a nucleic acid encoding,
respectively, HC CDR1, HC CDR2, HC CDR3, LC CDR1, LC CDR2, LC CDR3, HC variable region
30 and LC variable region.

As indicated herein, nucleic acid molecules of the present invention which comprise a nucleic
acid encoding a CNGH0004 antibody can include, but are not limited to, those encoding the amino acid
sequence of an antibody fragment, by itself; the coding sequence for the entire antibody or a portion
thereof; the coding sequence for an antibody, fragment or portion, as well as additional sequences, such
35 as the coding sequence of at least one signal leader or fusion peptide, intron, non-coding 5' and 3'
sequences, such as the transcribed, non-translated sequences that play a role in transcription, mRNA
processing, including splicing and polyadenylation signals (for example - ribosome binding and

5 stability of mRNA); an additional coding sequence that codes for additional amino acids, such as those that provide additional functionalities. Thus, the sequence encoding an antibody can be fused to a marker sequence, such as a sequence encoding a peptide that facilitates purification of the fused antibody comprising an antibody fragment or portion.

Polynucleotides Which Selectively Hybridize to a Polynucleotide as Described Herein

10

The present invention provides isolated nucleic acids that hybridize under selective hybridization conditions to a polynucleotide disclosed herein. Thus, the polynucleotides of this embodiment can be used for isolating, detecting, and/or quantifying nucleic acids comprising such polynucleotides. For example, polynucleotides of the present invention can be used to identify, isolate, or amplify partial or full-length clones in a deposited library. In some embodiments, the polynucleotides are genomic or cDNA sequences isolated, or otherwise complementary to, a cDNA from a human or mammalian nucleic acid library.

15

Preferably, the cDNA library comprises at least 80% full-length sequences, preferably at least 85% or 90% full-length sequences, and more preferably at least 95% full-length sequences. The cDNA libraries can be normalized to increase the representation of rare sequences. Low or moderate stringency hybridization conditions are typically, but not exclusively, employed with sequences having a reduced sequence identity relative to complementary sequences. Moderate and high stringency conditions can optionally be employed for sequences of greater identity. Low stringency conditions allow selective hybridization of sequences having about 70% sequence identity and can be employed to identify orthologous or paralogous sequences.

20

Optionally, polynucleotides of this invention will encode at least a portion of an antibody encoded by the polynucleotides described herein. The polynucleotides of this invention embrace nucleic acid sequences that can be employed for selective hybridization to a polynucleotide encoding an antibody of the present invention. See, e.g., Ausubel, supra; Colligan, supra, each entirely incorporated herein by reference.

25

Construction of Nucleic Acids

The isolated nucleic acids of the present invention can be made using (a) recombinant methods, (b) synthetic techniques, (c) purification techniques, or combinations thereof, as well-known in the art.

30

The nucleic acids can conveniently comprise sequences in addition to a polynucleotide of the present invention. For example, a multi-cloning site comprising one or more endonuclease restriction sites can be inserted into the nucleic acid to aid in isolation of the polynucleotide. Also, translatable sequences can be inserted to aid in the isolation of the translated polynucleotide of the present invention. For example, a hexa-histidine marker sequence provides a convenient means to purify the polypeptides of

35

5 the present invention. The nucleic acid of the present invention - excluding the coding sequence - is optionally a vector, adapter, or linker for cloning and/or expression of a polynucleotide of the present invention.

Additional sequences can be added to such cloning and/or expression sequences to optimize their function in cloning and/or expression, to aid in isolation of the polynucleotide, or to improve the
10 introduction of the polynucleotide into a cell. Use of cloning vectors, expression vectors, adapters, and linkers is well known in the art. (See, e.g., Ausubel, *supra*, or Sambrook, *supra*)

Recombinant Methods for Constructing Nucleic Acids

The isolated nucleic acid compositions of this invention, such as RNA, cDNA, genomic DNA, or any combination thereof, can be obtained from biological sources using any number of cloning
15 methodologies known to those of skill in the art. In some embodiments, oligonucleotide probes that selectively hybridize, under stringent conditions, to the polynucleotides of the present invention are used to identify the desired sequence in a cDNA or genomic DNA library. The isolation of RNA, and construction of cDNA and genomic libraries, is well known to those of ordinary skill in the art. (See, e.g., Ausubel, *supra*, or Sambrook, *supra*)

20 Nucleic Acid Screening and Isolation Methods

A cDNA or genomic library can be screened using a probe based upon the sequence of a polynucleotide of the present invention, such as those disclosed herein. Probes can be used to hybridize with genomic DNA or cDNA sequences to isolate homologous genes in the same or different organisms. Those of skill in the art will appreciate that various degrees of stringency of hybridization can be
25 employed in the assay; and either the hybridization or the wash medium can be stringent. As the conditions for hybridization become more stringent, there must be a greater degree of complementarity between the probe and the target for duplex formation to occur. The degree of stringency can be controlled by one or more of temperature, ionic strength, pH and the presence of a partially denaturing solvent such as formamide. For example, the stringency of hybridization is conveniently varied by
30 changing the polarity of the reactant solution through, for example, manipulation of the concentration of formamide within the range of 0% to 50%. The degree of complementarity (sequence identity) required for detectable binding will vary in accordance with the stringency of the hybridization medium and/or wash medium. The degree of complementarity will optimally be 100%, or 70-100%, or any range or value therein. However, it should be understood that minor sequence variations in the probes and primers
35 can be compensated for by reducing the stringency of the hybridization and/or wash medium.

5 Methods of amplification of RNA or DNA are well known in the art and can be used according to the present invention without undue experimentation, based on the teaching and guidance presented herein.

Known methods of DNA or RNA amplification include, but are not limited to, polymerase chain reaction (PCR) and related amplification processes (see, e.g., U.S. Patent Nos. 4,683,195, 4,683,202, 4,800,159, 4,965,188, to Mullis, et al.; 4,795,699 and 4,921,794 to Tabor, et al; 5,142,033 to Innis; 5,122,464 to Wilson, et al.; 5,091,310 to Innis; 5,066,584 to Gyllensten, et al; 4,889,818 to Gelfand, et al; 4,994,370 to Silver, et al; 4,766,067 to Biswas; 4,656,134 to Ringold) and RNA mediated amplification that uses anti-sense RNA to the target sequence as a template for double-stranded DNA synthesis (U.S. Patent No. 5,130,238 to Malek, et al, with the tradename NASBA), the entire contents of which references are incorporated herein by reference. (See, e.g., Ausubel, *supra*; or Sambrook, *supra*.)

For instance, polymerase chain reaction (PCR) technology can be used to amplify the sequences of polynucleotides of the present invention and related genes directly from genomic DNA or cDNA libraries. PCR and other in vitro amplification methods can also be useful, for example, to clone nucleic acid sequences that code for polypeptides to be expressed, to make nucleic acids to use as probes for detecting the presence of the desired mRNA in samples, for nucleic acid sequencing, or for other purposes. Examples of techniques sufficient to direct persons of skill through in vitro amplification methods are found in Berger, *supra*, Sambrook, *supra*, and Ausubel, *supra*; as well as Mullis, et al., U.S. Patent No. 4,683,202 (1987); and Innis, et al., PCR Protocols A Guide to Methods and Applications, Eds., Academic Press Inc., San Diego, CA (1990). Commercially available kits for genomic PCR amplification are known in the art. See, e.g., Advantage-GC Genomic PCR Kit (Clontech). Additionally, e.g., the T4 gene 32 polypeptide (Boehringer Mannheim) can be used to improve yield of long PCR products.

Synthetic Methods for Constructing Nucleic Acids

The isolated nucleic acids of the present invention can also be prepared by direct chemical synthesis by known methods (see, e.g., Ausubel, et al., *supra*). Chemical synthesis generally produces a single-stranded oligonucleotide, which can be converted into double-stranded DNA by hybridization with a complementary sequence, or by polymerization with a DNA polymerase using the single strand as a template. One of skill in the art will recognize that while chemical synthesis of DNA can be limited to sequences of about 100 or more bases, longer sequences can be obtained by the ligation of shorter sequences.

Recombinant Expression Cassettes

5 The present invention further provides recombinant expression cassettes comprising a nucleic acid of the present invention. A nucleic acid sequence of the present invention, for example a cDNA or a genomic sequence encoding an antibody of the present invention, can be used to construct a recombinant expression cassette that can be introduced into at least one desired host cell. A recombinant expression cassette will typically comprise a polynucleotide of the present invention operably linked to
10 transcriptional initiation regulatory sequences that will direct the transcription of the polynucleotide in the intended host cell. Both heterologous and non-heterologous (i.e., endogenous) promoters can be employed to direct expression of the nucleic acids of the present invention.

 In some embodiments, isolated nucleic acids that serve as promoter, enhancer, or other elements can be introduced in the appropriate position (upstream, downstream or in intron) of a non-heterologous
15 form of a polynucleotide of the present invention so as to up or down regulate expression of a polynucleotide of the present invention. For example, endogenous promoters can be altered *in vivo* or *in vitro* by mutation, deletion and/or substitution.

Vectors And Host Cells

 The present invention also relates to vectors that include isolated nucleic acid molecules of the
20 present invention, host cells that are genetically engineered with the recombinant vectors, and the production of at least one CNGH0004 antibody by recombinant techniques, as is well known in the art. See, e.g., Sambrook, et al., supra; Ausubel, et al., supra, each entirely incorporated herein by reference.

 The polynucleotides can optionally be joined to a vector containing a selectable marker for
25 propagation in a host. Generally, a plasmid vector is introduced in a precipitate, such as a calcium phosphate precipitate, or in a complex with a charged lipid. If the vector is a virus, it can be packaged *in vitro* using an appropriate packaging cell line and then transduced into host cells.

 The DNA insert should be operatively linked to an appropriate promoter. The expression
30 constructs will further contain sites for transcription initiation, termination and, in the transcribed region, a ribosome binding site for translation. The coding portion of the mature transcripts expressed by the constructs will preferably include a translation initiating at the beginning and a termination codon (e.g., UAA, UGA or UAG) appropriately positioned at the end of the mRNA to be translated, with UAA and UAG preferred for mammalian or eukaryotic cell expression.

 Expression vectors will preferably but optionally include at least one selectable marker. Such
35 markers include, e.g., but not limited to, methotrexate (MTX), dihydrofolate reductase (DHFR, US Pat.Nos. 4,399,216; 4,634,665; 4,656,134; 4,956,288; 5,149,636; 5,179,017, ampicillin, neomycin (G418), mycophenolic acid, or glutamine synthetase (GS, US Pat.Nos. 5,122,464; 5,770,359;

5 5,827,739) resistance for eukaryotic cell culture, and tetracycline or ampicillin resistance genes for
culturing in *E. coli* and other bacteria or prokaryotics (the above patents are entirely incorporated
hereby by reference). Appropriate culture mediums and conditions for the above-described host cells
are known in the art. Suitable vectors will be readily apparent to the skilled artisan. Introduction of a
vector construct into a host cell can be effected by calcium phosphate transfection, DEAE-dextran
10 mediated transfection, cationic lipid-mediated transfection, electroporation, transduction, infection or
other known methods. Such methods are described in the art, such as Sambrook, supra, Chapters 1-4
and 16-18; Ausubel, supra, Chapters 1, 9, 13, 15, 16.

At least one antibody of the present invention can be expressed in a modified form, such as a
fusion polypeptide, and can include not only secretion signals, but also additional heterologous
15 functional regions. For instance, a region of additional amino acids, particularly charged amino acids,
can be added to the N-terminus of an antibody to improve stability and persistence in the host cell,
during purification, or during subsequent handling and storage. Also, peptide moieties can be added to
an antibody of the present invention to facilitate purification. Such regions can be removed prior to
final preparation of an antibody or at least one fragment thereof. Such methods are described in many
20 standard laboratory manuals, such as Sambrook, supra, Chapters 17.29-17.42 and 18.1-18.74; Ausubel,
supra, Chapters 16, 17 and 18.

Those of ordinary skill in the art are knowledgeable in the numerous expression systems available
for expression of a nucleic acid encoding a polypeptide of the present invention.

Alternatively, nucleic acids of the present invention can be expressed in a host cell by turning on
25 (by manipulation) in a host cell that contains endogenous DNA encoding an antibody of the present
invention. Such methods are well known in the art, e.g., as described in US patent Nos. 5,580,734,
5,641,670, 5,733,746, and 5,733,761, entirely incorporated herein by reference.

Illustrative of cell cultures useful for the production of the antibodies, specified portions or
variants thereof, are mammalian cells. Mammalian cell systems often will be in the form of monolayers of
30 cells although mammalian cell suspensions or bioreactors can also be used. A number of suitable host
cell lines capable of expressing intact glycosylated polypeptides have been developed in the art, and
include the COS-1 (e.g., ATCC CRL 1650), COS-7 (e.g., ATCC CRL-1651), HEK293, BHK21 (e.g.,
ATCC CRL-10), CHO (e.g., ATCC CRL 1610) and BSC-1 (e.g., ATCC CRL-26) cell lines, Cos-7 cells,
CHO cells, hep G2 cells, P3X63Ag8.653, SP2/0-Ag14, 293 cells, HeLa cells and the like, which are
35 readily available from, for example, American Type Culture Collection, Manassas, Va (www.atcc.org).

Preferred host cells include cells of lymphoid origin such as myeloma and lymphoma cells.
Particularly preferred host cells are P3X63Ag8.653 cells (ATCC Accession Number CRL-1580) and

5 SP2/0-Ag14 cells (ATCC Accession Number CRL-1851). In a particularly preferred embodiment, the recombinant cell is a P3X63Ab8.653 or a SP2/0-Ag14 cell.

Expression vectors for these cells can include one or more of the following expression control sequences, such as, but not limited to an origin of replication; a promoter (e.g., late or early SV40 promoters, the CMV promoter (US Pat.Nos. 5,168,062; 5,385,839), an HSV tk promoter, a pgk
10 (phosphoglycerate kinase) promoter, an EF-1 alpha promoter (US Pat.No. 5,266,491), at least one human immunoglobulin promoter; an enhancer, and/or processing information sites, such as ribosome binding sites, RNA splice sites, polyadenylation sites (e.g., an SV40 large T Ag poly A addition site), and transcriptional terminator sequences. See, e.g., Ausubel et al., supra; Sambrook, et al., supra. Other cells useful for production of nucleic acids or polypeptides of the present invention are known and/or available,
15 for instance, from the American Type Culture Collection Catalogue of Cell Lines and Hybridomas (www.atcc.org) or other known or commercial sources.

When eukaryotic host cells are employed, polyadenylation or transcription terminator sequences are typically incorporated into the vector. An example of a terminator sequence is the polyadenylation sequence from the bovine growth hormone gene. Sequences for accurate splicing of the transcript can
20 also be included. An example of a splicing sequence is the VP1 intron from SV40 (Sprague, et al., J. Virol. 45:773-781 (1983)). Additionally, gene sequences to control replication in the host cell can be incorporated into the vector, as known in the art.

Purification of a CNGH0004 Polypeptide or Antibody

A CNGH0004 polypeptide or antibody can be recovered and purified from recombinant cell
25 cultures by well-known methods including, but not limited to, polypeptide A purification, ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography and lectin chromatography. High performance liquid chromatography ("HPLC") can also be employed for purification. See, e.g., Colligan, Current Protocols in
30 Immunology, or Current Protocols in Polypeptide Science, John Wiley & Sons, NY, NY, (1997-2001), e.g., Chapters 1, 4, 6, 8, 9, 10, each entirely incorporated herein by reference.

CNGH0004 polypeptides and antibodies of the present invention include naturally purified products, products of chemical synthetic procedures, and products produced by recombinant techniques from a eukaryotic host, including, for example, yeast, higher plant, insect and mammalian cells.
35 Depending upon the host employed in a recombinant production procedure, the polypeptide or antibody of the present invention can be glycosylated or can be non-glycosylated, with glycosylated preferred. Such methods are described in many standard laboratory manuals, such as Sambrook, supra,

5 Sections 17.37-17.42; Ausubel, supra, Chapters 10, 12, 13, 16, 18 and 20, Colligan, Protein Science, supra, Chapters 12-14, all entirely incorporated herein by reference.

CNGH0004 Polypeptides and Antibodies

The isolated polypeptides and antibodies of the present invention comprise at least one polypeptide and/or antibody amino acid sequence disclosed or described herein encoded by any suitable
10 polynucleotide, or any at least one isolated or prepared polypeptide antibody. Preferably, the at least one polypeptide has at least one CNGH0004 activity and the at least one antibody binds human CNGH0004 and, thereby partially or substantially modulates at least one structural or biological activity of at least one CNGH0004 polypeptide.

As used herein, the term "CNGH0004 polypeptide" refers to a polypeptide as described herein
15 that has at least one CNGH0004-dependent activity, such as 5-10000%, of the activity of a known or other CNGH0004 polypeptide or active portion thereof, preferably by at least about 10, 20, 30, 40, 50, 55, 60, 65, 70, 75, 80, 85, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, or 1000% or more, depending on the assay. The capacity of a CNGH0004 polypeptide to have at least one CNGH0004-dependent activity is preferably assessed by at least one suitable
20 CNGH0004 polypeptide or receptor assay, as described herein and/or as known in the art.

As used herein, the term "neutralizing antibody" refers to an antibody that can inhibit at least one CNGH0004-dependent activity by about 5-1020%, preferably by at least about 10, 20, 30, 40, 50, 55, 60, 65, 70, 75, 80, 85, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, or 1000% or more depending on the assay. The capacity of a CNGH0004 antibody to
25 inhibit an CNGH0004-dependent activity is preferably assessed by at least one suitable CNGH0004 polypeptide or receptor assay, as described herein and/or as known in the art. An antibody of the invention can be of any class (IgG, IgA, IgM, IgE, IgD, etc.) or isotype and can comprise a kappa or lambda light chain. In one embodiment, the human antibody comprises an IgG heavy chain or defined fragment, for example, at least one of isotypes, IgG1, IgG2, IgG3 or IgG4. Antibodies of this type can be
30 prepared by employing a transgenic mouse or other transgenic non-human mammal comprising at least one human light chain (e.g., combination of V, D and J regions) or heavy chain (e.g., γ 1, γ 2, γ 3, γ 4, μ 1, α 1, α 2, δ , ϵ) transgenes as described herein and/or as known in the art. In another embodiment, the human CNGH0004 human antibody comprises an IgG1 heavy chain and an IgG1 light chain.

At least one antibody of the invention binds at least one specified epitope specific to at least
35 one CNGH0004 polypeptide, subunit, fragment, portion or any combination thereof. The at least one epitope can comprise at least one antibody binding region that comprises at least one portion of the polypeptide, which epitope can optionally comprise at least one portion of at least one extracellular,

5 soluble, hydrophilic, external or cytoplasmic portion of the polypeptide. The at least one specified epitope can comprise any combination of at least one amino acid sequence of at least 1-3 amino acids to the entire specified portion of contiguous amino acids of the SEQ ID NO:1.

The at least one antibody of the present invention can preferably comprise at least one antigen-binding region that comprises at least one human complementarity determining region (CDR1, CDR2
10 and CDR3) or variant of at least one heavy chain variable region and/or at least one human complementarity determining region (CDR1, CDR2 and CDR3) or variant of at least one light chain variable region. In a particular embodiment, the polypeptide and antibody can have an antigen-binding region that comprises at least a portion of at least one heavy chain (HC) CDR (i.e., HC CDR1, HC
15 CDR2 and/or HC CDR3) having the amino acid sequence of the corresponding HC CDRs 1, 2 and/or 3. In another particular embodiment, the antibody or antigen-binding portion or variant can have at least one antigen-binding region that comprises at least a portion of at least one light chain (LC) CDR (i.e., LC CDR1, LC CDR2 and/or LC CDR3). Such antibodies can be prepared by chemically joining together the various portions (e.g., CDRs, framework) of the antibody using conventional techniques, by preparing and expressing a (i.e., one or more) nucleic acid molecule that encodes the antibody using
20 conventional techniques of recombinant DNA technology or by using any other suitable method.

The CNGH0004 antibody can comprise at least one of a heavy or light chain variable region having a defined amino acid sequence. For example, in a preferred embodiment, the CNGH0004 antibody comprises at least one heavy chain variable region; and/or at least one light chain variable
25 region. Antibodies that bind to human CNGH0004 and that comprise a defined heavy or light chain variable region can be prepared using suitable methods, such as phage display (Katsube, Y., *et al.*, *Int J Mol. Med*, 1(5):863-868 (1998)) or methods that employ transgenic animals, as known in the art and/or as described herein. For example, a transgenic mouse, comprising a functionally rearranged human immunoglobulin heavy chain transgene and a transgene comprising DNA from a human immunoglobulin light chain locus that can undergo functional rearrangement, can be immunized with
30 human CNGH0004 or a fragment thereof to elicit the production of antibodies. If desired, the antibody producing cells can be isolated and hybridomas or other immortalized antibody-producing cells can be prepared as described herein and/or as known in the art. Alternatively, the antibody, specified portion or variant can be expressed using the encoding nucleic acid or portion thereof in a suitable host cell.

The invention also relates to antibodies, antigen-binding fragments, immunoglobulin chains
35 and CDRs comprising amino acids in a sequence that is substantially the same as an amino acid sequence described herein. Preferably, such antibodies or antigen-binding fragments and antibodies comprising such chains or CDRs can bind human CNGH0004 with high affinity (e.g., K_D less than or

- 5 equal to about 10^{-9} M). Amino acid sequences that are substantially the same as the sequences described herein include sequences comprising conservative amino acid substitutions, as well as amino acid deletions and/or insertions. A conservative amino acid substitution refers to the replacement of a first amino acid by a second amino acid that has chemical and/or physical properties (e.g. charge, structure, polarity, hydrophobicity/ hydrophilicity) that are similar to those of the first amino acid.
- 10 Conservative substitutions include replacement of one amino acid by another within the following groups: lysine (K), arginine (R) and histidine (H); aspartate (D) and glutamate (E); asparagine (N), glutamine (Q), serine (S), threonine (T), tyrosine (Y), K, R, H, D and E; alanine (A), valine (V), leucine (L), isoleucine (I), proline (P), phenylalanine (F), tryptophan (W), methionine (M), cysteine (C) and glycine (G); F, W and Y; C, S and T.
- 15 **Amino Acid Codes**
The amino acids that make up CNGH0004 polypeptides or antibodies of the present invention are often abbreviated. The amino acid designations can be indicated by designating the amino acid by its single letter code, its three letter code, name, or three nucleotide codon(s) as is well understood in the art (see Alberts, B., et al., Molecular Biology of The Cell, Third Ed., Garland Publishing, Inc., New York, 1994):
- 20

| SINGLE LETTER CODE | THREE LETTER CODE | NAME | THREE NUCLEOTIDE CODON(S) |
|--------------------|-------------------|---------------|------------------------------|
| A | Ala | Alanine | GCA, GCC, GCG, GCU |
| C | Cys | Cysteine | UGC, UGU |
| D | Asp | Aspartic acid | GAC, GAU |
| E | Glu | Glutamic acid | GAA, GAG |
| F | Phe | Phenylalanine | UUC, UUU |
| G | Gly | Glycine | GGA, GGC, GGG, GGU |
| H | His | Histidine | CAC, CAU |
| I | Ile | Isoleucine | AUA, AUC, AUU |
| K | Lys | Lysine | AAA, AAG |
| L | Leu | Leucine | UUA, UUG, CUA, CUC, CUG, CUU |
| M | Met | Methionine | AUG |
| N | Asn | Asparagine | AAC, AAU |
| P | Pro | Proline | CCA, CCC, CCG, CCU |
| Q | Gln | Glutamine | CAA, CAG |
| R | Arg | Arginine | AGA, AGG, CGA, CGC, CGG, CGU |
| S | Ser | Serine | AGC, AGU, UCA, UCC, UCG, UCU |
| T | Thr | Threonine | ACA, ACC, ACG, ACU |
| V | Val | Valine | GUA, GUC, GUG, GUU |
| W | Trp | Tryptophan | UGG |

| | | | |
|---|-----|----------|----------|
| Y | Tyr | Tyrosine | UAC, UAU |
|---|-----|----------|----------|

5

An CNGH0004 antibody of the present invention can include one or more amino acid substitutions, deletions or additions, either from natural mutations or human manipulation, as specified herein.

Of course, the number of amino acid substitutions a skilled artisan would make depends on many factors, including those described above. Generally speaking, the number of amino acid substitutions, insertions or deletions for any given CNGH0004 antibody, fragment or variant will not be more than 40, 30, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, such as 1-30 or any range or value therein, as specified herein.

Amino acids in an CNGH0004 antibody of the present invention that are essential for function can be identified by methods known in the art, such as site-directed mutagenesis or alanine-scanning mutagenesis (e.g., Ausubel, supra, Chapters 8, 15; Cunningham and Wells, Science 244:1081-1085 (1989)). The latter procedure introduces single alanine mutations at every residue in the molecule. The resulting mutant molecules are then tested for biological activity, such as, but not limited to at least one CNGH0004 neutralizing activity. Sites that are critical for antibody binding can also be identified by structural analysis such as crystallization, nuclear magnetic resonance or photoaffinity labeling (Smith, et al., J. Mol. Biol. 224:899-904 (1992) and de Vos, et al., Science 255:306-312 (1992)).

CNGH0004 polypeptides of the present invention can include, but are not limited to, at least one portion, sequence or combination selected from 3-100 to all of the contiguous amino acids of at least one of SEQ ID NO:1, such as but not limited to, 1-82, 83-259, 259-377, 378-433, 434-438, 438-493, 498-559, 1631-1685, 1690-1743, 1789-1842, 2021-2078, 2083-2141, 2146-2199, 2204-2259, 2264-2318, 2323-2376, 2381-2435, 2440-2493, 2498-2551, 2556-2608, 2660-2712, 2717-2770, 2775-2828, 2833-2886, 2891-2944, 2949-3002, 3007-3059, 3064-3117, 3122-3176, 3181-3236, 3241-3294, 3299-3352, 3357-3411, 3416-3468, 1231-1267, 1269-1305, 1307-1343, 1345-1381, 1383-1419, 1748-1784, 3468-3499, 3504-3531, 3536-3563, 1431-1623, 643-722, 561-642, 1196-1229, 727-787, 1847-1900, 1963-2016, 1905-1958, 999-1036, 1041-1106, 1108-1160, 1-41, or 305-360 of SEQ ID NO:1.

Non-limiting CDRs or portions of CNGH0004 polypeptides or antibodies of the invention that can enhance or maintain at least one of the listed activities include, but are not limited to, any of the above polypeptides, further comprising at least one mutation corresponding to at least one substitution selected from the group consisting of at least one of S249L, V507I, C842W, E980G, Y1063C, K1416Q, D1442V, A1810E.

35

5 An CNGH0004 polypeptide can further optionally comprise a polypeptide of at least one of 70-100% of the contiguous amino acids of at least one of SEQ ID NO:1 or any variant thereof.

In one embodiment, the amino acid sequence of a CNGH0004 polypeptide or antibody has about 70-100% identity (e.g., 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or any range or value therein) to the amino acid sequence
10 of the corresponding chain of at least one of SEQ ID NO:1. Preferably, 70-100% amino acid identity (i.e., 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or any range or value therein) is determined using a suitable computer algorithm, as known in the art.

The polypeptides and antibodies of the present invention, or specified variants thereof, can comprise any number of contiguous amino acid residues from an antibody of the present invention,
15 wherein that number is selected from the group of integers consisting of from 10-100% of the number of contiguous residues in a CNGH0004 polypeptide or antibody. Optionally, this subsequence of contiguous amino acids is at least about 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250 or more amino acids in length, or any range or value therein. Further, the number of such subsequences can be any integer selected from the group consisting
20 of from 1 to 20, such as at least 2, 3, 4, or 5.

As those of skill will appreciate, the present invention includes at least one biologically active polypeptide or antibody of the present invention. Biologically active polypeptides or antibodies have a specific activity at least 20%, 30%, or 40%, and preferably at least 50%, 60%, or 70%, and most preferably at least 80%, 90%, or 95%-1000% of that of the native (non-synthetic), endogenous or related
25 and known polypeptide or antibody. Methods of assaying and quantifying measures of enzymatic activity and substrate specificity, are well known to those of skill in the art.

In another aspect, the invention relates to CNGH0004 polypeptides or antibodies of the invention, as described herein, which are modified by the covalent attachment of a moiety. Such modification can produce a CNGH0004 polypeptide or antibody with improved pharmacokinetic
30 properties (e.g., increased *in vivo* serum half-life). The organic moiety can be a linear or branched hydrophilic polymeric group, fatty acid group, or fatty acid ester group. In particular embodiments, the hydrophilic polymeric group can have a molecular weight of about 800 to about 120,000 Daltons and can be a polyalkane glycol (e.g., polyethylene glycol (PEG), polypropylene glycol (PPG)), carbohydrate polymer, amino acid polymer or polyvinyl pyrrolidone, and the fatty acid or fatty acid
35 ester group can comprise from about eight to about forty carbon atoms.

The modified polypeptides and antibodies of the invention can comprise one or more organic moieties that are covalently bonded, directly or indirectly, to the antibody or polypeptide. Each

5 organic moiety that is bonded to the polypeptide or antibody of the invention can independently be a hydrophilic polymeric group, a fatty acid group or a fatty acid ester group. As used herein, the term "fatty acid" encompasses mono-carboxylic acids and di-carboxylic acids. A "hydrophilic polymeric group," as the term is used herein, refers to an organic polymer that is more soluble in water than in octane. For example, polylysine is more soluble in water than in octane. Thus, a CNGH0004 antibody
10 or polypeptide modified by the covalent attachment of polylysine is encompassed by the invention. Hydrophilic polymers suitable for modifying antibodies or polypeptides of the invention can be linear or branched and include, for example, polyalkane glycols (e.g., PEG, monomethoxy-polyethylene glycol (mPEG), PPG and the like), carbohydrates (e.g., dextran, cellulose, oligosaccharides, polysaccharides and the like), polymers of hydrophilic amino acids (e.g., polylysine, polyarginine,
15 polyaspartate and the like), polyalkane oxides (e.g., polyethylene oxide, polypropylene oxide and the like) and polyvinyl pyrrolidone. Preferably, the hydrophilic polymer that modifies the polypeptide or antibody of the invention has a molecular weight of about 800 to about 150,000 Daltons as a separate molecular entity. For example PEG₅₀₀₀ and PEG_{20,000}, wherein the subscript is the average molecular weight of the polymer in Daltons, can be used. The hydrophilic polymeric group can be substituted
20 with one to about six alkyl, fatty acid or fatty acid ester groups. Hydrophilic polymers that are substituted with a fatty acid or fatty acid ester group can be prepared by employing suitable methods. For example, a polymer comprising an amine group can be coupled to a carboxylate of the fatty acid or fatty acid ester, and an activated carboxylate (e.g., activated with N, N-carbonyl diimidazole) on a fatty acid or fatty acid ester can be coupled to a hydroxyl group on a polymer.

25 Fatty acids and fatty acid esters suitable for modifying antibodies of the invention can be saturated or can contain one or more units of unsaturation. Fatty acids that are suitable for modifying antibodies of the invention include, for example, n-dodecanoate (C₁₂, laurate), n-tetradecanoate (C₁₄, myristate), n-octadecanoate (C₁₈, stearate), n-eicosanoate (C₂₀, arachidate), n-docosanoate (C₂₂, behenate), n-triacontanoate (C₃₀), n-tetracontanoate (C₄₀), *cis*- Δ 9-octadecanoate (C₁₈, oleate), all *cis*-
30 Δ 5,8,11,14-eicosatetraenoate (C₂₀, arachidonate), octanedioic acid, tetradecanedioic acid, octadecanedioic acid, docosanedioic acid, and the like. Suitable fatty acid esters include mono-esters of dicarboxylic acids that comprise a linear or branched lower alkyl group. The lower alkyl group can comprise from one to about twelve, preferably one to about six, carbon atoms.

The modified human polypeptides and antibodies can be prepared using suitable methods, such
35 as by reaction with one or more modifying agents. A "modifying agent" as the term is used herein, refers to a suitable organic group (e.g., hydrophilic polymer, a fatty acid, a fatty acid ester) that comprises an activating group. An "activating group" is a chemical moiety or functional group that

5 can, under appropriate conditions, react with a second chemical group thereby forming a covalent bond between the modifying agent and the second chemical group. For example, amine-reactive activating groups include electrophilic groups such as tosylate, mesylate, halo (chloro, bromo, fluoro, iodo), N-hydroxysuccinimidyl esters (NHS), and the like. Activating groups that can react with thiols include, for example, maleimide, iodoacetyl, acryloyl, pyridyl disulfides, 5-thiol-2-nitrobenzoic acid thiol
10 (TNB-thiol), and the like. An aldehyde functional group can be coupled to amine- or hydrazide-containing molecules, and an azide group can react with a trivalent phosphorous group to form phosphoramidate or phosphorimide linkages. Suitable methods to introduce activating groups into molecules are known in the art (see for example, Hermanson, G. T., *Bioconjugate Techniques*, Academic Press: San Diego, CA (1996)). An activating group can be bonded directly to the organic
15 group (e.g., hydrophilic polymer, fatty acid, fatty acid ester), or through a linker moiety, for example a divalent C₁-C₁₂ group wherein one or more carbon atoms can be replaced by a heteroatom such as oxygen, nitrogen or sulfur. Suitable linker moieties include, for example, tetraethylene glycol, -(CH₂)₃-, -NH-(CH₂)₆-NH-, -(CH₂)₂-NH- and -CH₂-O-CH₂-CH₂-O-CH₂-CH₂-O-CH₂-NH-. Modifying agents that comprise a linker moiety can be produced, for example, by reacting a mono-Boc-alkyldiamine (e.g.,
20 mono-Boc-ethylenediamine, mono-Boc-diaminohexane) with a fatty acid in the presence of 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) to form an amide bond between the free amine and the fatty acid carboxylate. The Boc protecting group can be removed from the product by treatment with trifluoroacetic acid (TFA) to expose a primary amine that can be coupled to another carboxylate as described, or can be reacted with maleic anhydride and the resulting product cyclized to produce an
25 activated maleimido derivative of the fatty acid. (See, for example, Thompson, *et al.*, WO 92/16221 the entire teachings of which are incorporated herein by reference.)

Modified polypeptides or antibodies of the invention can be produced by reacting the polypeptide or antibody with a modifying agent. For example, the organic moieties can be bonded to the antibody or polypeptide in a non-site specific manner by employing an amine-reactive modifying
30 agent, for example, an NHS ester of PEG. Modified CNGH0004 polypeptides or antibodies can also be prepared by reducing disulfide bonds (e.g., intra-chain disulfide bonds) of the polypeptide and antibody. The reduced polypeptide and antibody can then be reacted with a thiol-reactive modifying agent to produce the modified antibody of the invention. Modified polypeptides and antibodies comprising an organic moiety that is bonded to specific sites of an antibody of the present invention
35 can be prepared using suitable methods, such as reverse proteolysis (Fisch *et al.*, *Bioconjugate Chem.*, 3:147-153 (1992); Werlen *et al.*, *Bioconjugate Chem.*, 5:411-417 (1994); Kumaran *et al.*, *Polypeptide Sci.* 6(10):2233-2241 (1997); Itoh *et al.*, *Bioorg. Chem.*, 24(1): 59-68 (1996); Capellas *et al.*,

- 5 *Biotechnol. Bioeng.*, 56(4):456-463 (1997)), and the methods described in Hermanson, G. T.,
Bioconjugate Techniques, Academic Press: San Diego, CA (1996).

ANTI-IDIOTYPE ANTIBODIES TO ANTI-CNGH0004 ANTIBODY COMPOSITIONS

In addition to monoclonal or chimeric CNGH0004 antibodies, the present invention is also directed to an idiotypic (Id) antibody specific for such antibodies of the invention. An anti-Id
10 antibody is an antibody that recognizes unique determinants generally associated with the antigen-binding region of another antibody. The Id can be prepared by immunizing an animal of the same species and genetic type (e.g. mouse strain) as the source of the Id antibody with the antibody or a CDR containing region thereof. The immunized animal will recognize and respond to the idiotypic determinants of the immunizing antibody and produce an anti-Id antibody. The anti-Id antibody may
15 also be used as an "immunogen" to induce an immune response in yet another animal, producing a so-called anti-Id antibody.

CNGH0004 POLYPEPTIDE AND ANTIBODY COMPOSITIONS

The present invention also provides at least one CNGH0004 antibody or polypeptide
20 composition comprising at least one, at least two, at least three, at least four, at least five, or at least 6-50, or any range or value therein, CNGH0004 antibodies or polypeptides thereof, as described herein. Such compositions can comprise 0.00001-99.9999 percent by weight, volume, concentration, molarity, or molality as liquid, gas, or dry solutions, mixtures, suspension, emulsions or colloids, as known in the art or as described herein, on any range or value therein, such as but not limited to 0.00001, 0.00003,
25 0.00005, 0.00009, 0.0001, 0.0003, 0.0005, 0.0009, 0.001, 0.003, 0.005, 0.009, 0.01, 0.02, 0.03, 0.05, 0.09, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 99.1, 99.2, 99.3, 99.4, 99.5,
30 99.6, 99.7, 99.8, 99.9 %. Such compositions of the present invention thus include but are not limited to 0.00001-100 mg/ml and/or 0.00001-100 mg/g.

The composition can optionally further comprise an effective amount of at least one compound or protein selected from at least one of an anti-infective drug, a cardiovascular (CV) system drug, a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug,
35 a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a nutritional drug or the like. Such drugs are well known in the art, including

- 5 formulations, indications, dosing and administration for each presented herein (see., e.g., Nursing 2001 Handbook of Drugs, 21st edition, Springhouse Corp., Springhouse, PA, 2001; Health Professional's Drug Guide 2001, ed., Shannon, Wilson, Stang, Prentice-Hall, Inc, Upper Saddle River, NJ; Pharmacotherapy Handbook, Wells et al., ed., Appleton & Lange, Stamford, CT, each entirely incorporated herein by reference).
- 10 The anti-infective drug can be at least one selected from amebicides or at least one antiprotozoals, anthelmintics, antifungals, antimalarials, antituberculosics or at least one antileprotics, aminoglycosides, penicillins, cephalosporins, tetracyclines, sulfonamides, fluoroquinolones, antivirals, macrolide anti-infectives, miscellaneous anti-infectives. The CV drug can be at least one selected from inotropics, antiarrhythmics, antianginals, antihypertensives, antilipemics, miscellaneous cardiovascular
- 15 drugs. The CNS drug can be at least one selected from nonnarcotic analgesics or at least one selected from antipyretics, nonsteroidal anti-inflammatory drugs, narcotic or at least one opioid analgesics, sedative-hypnotics, anticonvulsants, antidepressants, antianxiety drugs, antipsychotics, central nervous system stimulants, antiparkinsonians, miscellaneous central nervous system drugs. The ANS drug can be at least one selected from cholinergics (parasympathomimetics), anticholinergics, adrenergics
- 20 (sympathomimetics), adrenergic blockers (sympatholytics), skeletal muscle relaxants, neuromuscular blockers. The respiratory tract drug can be at least one selected from antihistamines, bronchodilators, expectorants or at least one antitussives, miscellaneous respiratory drugs. The GI tract drug can be at least one selected from antacids or at least one adsorbents or at least one antiflatulents, digestive enzymes or at least one gallstone solubilizers, antidiarrheals, laxatives, antiemetics, antiulcer drugs.
- 25 The hormonal drug can be at least one selected from corticosteroids, androgens or at least one anabolic steroids, estrogens or at least one progestins, gonadotropins, antidiabetic drugs or at least one glucagon, thyroid hormones, thyroid hormone antagonists, pituitary hormones, parathyroid-like drugs. The drug for fluid and electrolyte balance can be at least one selected from diuretics, electrolytes or at least one replacement solutions, acidifiers or at least one alkalinizers. The hematologic drug can be at least one
- 30 selected from hematinics, anticoagulants, blood derivatives, thrombolytic enzymes. The antineoplastics can be at least one selected from alkylating drugs, antimetabolites, antibiotic antineoplastics, antineoplastics that alter hormone balance, miscellaneous antineoplastics. The immunomodulation drug can be at least one selected from immunosuppressants, vaccines or at least one toxoids, antitoxins or at least one antivenins, immune serums, biological response modifiers. The
- 35 ophthalmic, otic, and nasal drugs can be at least one selected from ophthalmic anti-infectives, ophthalmic anti-inflammatories, miotics, mydriatics, ophthalmic vasoconstrictors, miscellaneous ophthalmics, otics, nasal drugs. The topical drug can be at least one selected from local anti-infectives,

5 scabicides or at least one pediculicides, topical corticosteroids. The nutritional drug can be at least one selected from vitamins, minerals, or calorics. See, e.g., contents of *Nursing 2001 Drug Handbook*, *supra*.

The at least one amebicide or antiprotozoal can be at least one selected from atovaquone, chloroquine hydrochloride, chloroquine phosphate, metronidazole, metronidazole hydrochloride,
10 pentamidine isethionate. The at least one anthelmintic can be at least one selected from mebendazole, pyrantel pamoate, thiabendazole. The at least one antifungal can be at least one selected from amphotericin B, amphotericin B cholesteryl sulfate complex, amphotericin B lipid complex, amphotericin B liposomal, fluconazole, flucytosine, griseofulvin microsize, griseofulvin ultramicrosize, itraconazole, ketoconazole, nystatin, terbinafine hydrochloride. The at least one
15 antimalarial can be at least one selected from chloroquine hydrochloride, chloroquine phosphate, doxycycline, hydroxychloroquine sulfate, mefloquine hydrochloride, primaquine phosphate, pyrimethamine, pyrimethamine with sulfadoxine. The at least one antituberculous or antileprotic can be at least one selected from clofazimine, cycloserine, dapson, ethambutol hydrochloride, isoniazid, pyrazinamide, rifabutin, rifampin, rifapentine, streptomycin sulfate. The at least one aminoglycoside
20 can be at least one selected from amikacin sulfate, gentamicin sulfate, neomycin sulfate, streptomycin sulfate, tobramycin sulfate. The at least one penicillin can be at least one selected from amoxicillin/clavulanate potassium, amoxicillin trihydrate, ampicillin, ampicillin sodium, ampicillin trihydrate, ampicillin sodium/sulbactam sodium, cloxacillin sodium, dicloxacillin sodium, mezlocillin sodium, nafcillin sodium, oxacillin sodium, penicillin G benzathine, penicillin G potassium, penicillin
25 G procaine, penicillin G sodium, penicillin V potassium, piperacillin sodium, piperacillin sodium/tazobactam sodium, ticarcillin disodium, ticarcillin disodium/clavulanate potassium. The at least one cephalosporin can be at least one selected from at least one of cefaclor, cefadroxil, cefazolin sodium, cefdinir, cefepime hydrochloride, cefixime, cefmetazole sodium, cefonicid sodium, cefoperazone sodium, cefotaxime sodium, cefotetan disodium, cefoxitin sodium, cefpodoxime proxetil,
30 cefprozil, ceftazidime, ceftibuten, ceftizoxime sodium, ceftriaxone sodium, cefuroxime axetil, cefuroxime sodium, cephalixin hydrochloride, cephalixin monohydrate, cephradine, loracarbef. The at least one tetracycline can be at least one selected from demeclocycline hydrochloride, doxycycline calcium, doxycycline hyclate, doxycycline hydrochloride, doxycycline monohydrate, minocycline hydrochloride, tetracycline hydrochloride. The at least one sulfonamide can be at least one selected
35 from co-trimoxazole, sulfadiazine, sulfamethoxazole, sulfisoxazole, sulfisoxazole acetyl. The at least one fluoroquinolone can be at least one selected from alatrofloxacin mesylate, ciprofloxacin, enoxacin, levofloxacin, lomefloxacin hydrochloride, nalidixic acid, norfloxacin, ofloxacin, sparfloxacin,

5 trovafloxacin mesylate. The at least one fluoroquinolone can be at least one selected from
alatrofloxacin mesylate, ciprofloxacin, enoxacin, levofloxacin, lomefloxacin hydrochloride, nalidixic
acid, norfloxacin, ofloxacin, sparfloxacin, trovafloxacin mesylate. The at least one antiviral can be at
least one selected from abacavir sulfate, acyclovir sodium, amantadine hydrochloride, amprenavir,
10 cidofovir, delavirdine mesylate, didanosine, efavirenz, famciclovir, fomivirsen sodium, foscarnet
sodium, ganciclovir, indinavir sulfate, lamivudine, lamivudine/zidovudine, nelfinavir mesylate,
nevirapine, oseltamivir phosphate, ribavirin, rimantadine hydrochloride, ritonavir, saquinavir,
saquinavir mesylate, stavudine, valacyclovir hydrochloride, zalcitabine, zanamivir, zidovudine. The at
least one macrolide anti-infective can be at least one selected from azithromycin, clarithromycin,
dirithromycin, erythromycin base, erythromycin estolate, erythromycin ethylsuccinate, erythromycin
15 lactobionate, erythromycin stearate. The at least one miscellaneous anti-infective can be at least one
selected from aztreonam, bacitracin, chloramphenicol sodium succinate, clindamycin hydrochloride,
clindamycin palmitate hydrochloride, clindamycin phosphate, imipenem and cilastatin sodium,
meropenem, nitrofurantoin macrocrystals, nitrofurantoin microcrystals, quinupristin/dalfopristin,
spectinomycin hydrochloride, trimethoprim, vancomycin hydrochloride. (See, e.g., pp. 24-214 of
20 *Nursing 2001 Drug Handbook*.)

The at least one inotropic can be at least one selected from amrinone lactate, digoxin,
milrinone lactate. The at least one antiarrhythmic can be at least one selected from adenosine,
amiodarone hydrochloride, atropine sulfate, bretylium tosylate, diltiazem hydrochloride, disopyramide,
disopyramide phosphate, esmolol hydrochloride, flecainide acetate, ibutilide fumarate, lidocaine
25 hydrochloride, mexiletine hydrochloride, moricizine hydrochloride, phenytoin, phenytoin sodium,
procainamide hydrochloride, propafenone hydrochloride, propranolol hydrochloride, quinidine
bisulfate, quinidine gluconate, quinidine polygalacturonate, quinidine sulfate, sotalol, tocainide
hydrochloride, verapamil hydrochloride. The at least one antianginal can be at least one selected from
amlodipine besylate, amyl nitrite, bepridil hydrochloride, diltiazem hydrochloride, isosorbide
30 dinitrate, isosorbide mononitrate, nadolol, nicardipine hydrochloride, nifedipine, nitroglycerin,
propranolol hydrochloride, verapamil, verapamil hydrochloride. The at least one antihypertensive can
be at least one selected from acebutolol hydrochloride, amlodipine besylate, atenolol, benazepril
hydrochloride, betaxolol hydrochloride, bisoprolol fumarate, candesartan cilexetil, captopril, carteolol
hydrochloride, carvedilol, clonidine, clonidine hydrochloride, diazoxide, diltiazem hydrochloride,
35 doxazosin mesylate, enalaprilat, enalapril maleate, eprosartan mesylate, felodipine, fenoldopam
mesylate, fosinopril sodium, guanabenz acetate, guanadrel sulfate, guanfacine hydrochloride,
hydralazine hydrochloride, irbesartan, isradipine, labetalol hydrochloride, lisinopril, losartan potassium,

5 methyldopa, methyldopate hydrochloride, metoprolol succinate, metoprolol tartrate, minoxidil, moexipril hydrochloride, nadolol, nicardipine hydrochloride, nifedipine, nisoldipine, nitroprusside sodium, penbutolol sulfate, perindopril erbumine, phentolamine mesylate, pindolol, prazosin hydrochloride, propranolol hydrochloride, quinapril hydrochloride, ramipril, telmisartan, terazosin hydrochloride, timolol maleate, trandolapril, valsartan, verapamil hydrochloride. The at least one
 10 antilipemic can be at least one selected from atorvastatin calcium, cerivastatin sodium, cholestyramine, colestipol hydrochloride, fenofibrate (micronized), fluvastatin sodium, gemfibrozil, lovastatin, niacin, pravastatin sodium, simvastatin. The at least one miscellaneous CV drug can be at least one selected from abciximab, alprostadil, arbutamine hydrochloride, cilostazol, clopidogrel bisulfate, dipyridamole, eptifibatide, midodrine hydrochloride, pentoxifylline, ticlopidine hydrochloride, tirofiban
 15 hydrochloride. (See, e.g., pp. 215-336 of *Nursing 2001 Drug Handbook*.)

The at least one nonnarcotic analgesic or antipyretic can be at least one selected from acetaminophen, aspirin, choline magnesium trisalicylate, diflunisal, magnesium salicylate. The at least one nonsteroidal anti-inflammatory drug can be at least one selected from celecoxib, diclofenac potassium, diclofenac sodium, etodolac, fenoprofen calcium, flurbiprofen, ibuprofen, indomethacin,
 20 indomethacin sodium trihydrate, ketoprofen, ketorolac tromethamine, nabumetone, naproxen, naproxen sodium, oxaprozin, piroxicam, rofecoxib, sulindac. The at least one narcotic or opioid analgesic can be at least one selected from alfentanil hydrochloride, buprenorphine hydrochloride, butorphanol tartrate, codeine phosphate, codeine sulfate, fentanyl citrate, fentanyl transdermal system, fentanyl transmucosal, hydromorphone hydrochloride, meperidine hydrochloride, methadone hydrochloride,
 25 morphine hydrochloride, morphine sulfate, morphine tartrate, nalbuphine hydrochloride, oxycodone hydrochloride, oxycodone pectinate, oxymorphone hydrochloride, pentazocine hydrochloride, pentazocine hydrochloride and naloxone hydrochloride, pentazocine lactate, propoxyphene hydrochloride, propoxyphene napsylate, remifentanil hydrochloride, sufentanil citrate, tramadol hydrochloride. The at least one sedative-hypnotic can be at least one selected from chloral hydrate,
 30 estazolam, flurazepam hydrochloride, pentobarbital, pentobarbital sodium, phenobarbital sodium, secobarbital sodium, temazepam, triazolam, zaleplon, zolpidem tartrate. The at least one anticonvulsant can be at least one selected from acetazolamide sodium, carbamazepine, clonazepam, clorazepate dipotassium, diazepam, divalproex sodium, ethosuximide, fosphenytoin sodium, gabapentin, lamotrigine, magnesium sulfate, phenobarbital, phenobarbital sodium, phenytoin,
 35 phenytoin sodium, phenytoin sodium (extended), primidone, tiagabine hydrochloride, topiramate, valproate sodium, valproic acid. The at least one antidepressant can be at least one selected from amitriptyline hydrochloride, amitriptyline pamoate, amoxapine, bupropion hydrochloride, citalopram

- 5 hydrobromide, clomipramine hydrochloride, desipramine hydrochloride, doxepin hydrochloride, fluoxetine hydrochloride, imipramine hydrochloride, imipramine pamoate, mirtazapine, nefazodone hydrochloride, nortriptyline hydrochloride, paroxetine hydrochloride, phenelzine sulfate, sertraline hydrochloride, tranylcypromine sulfate, trimipramine maleate, venlafaxine hydrochloride. The at least one antianxiety drug can be at least one selected from alprazolam, buspirone hydrochloride,
- 10 chlordiazepoxide, chlordiazepoxide hydrochloride, clorazepate dipotassium, diazepam, doxepin hydrochloride, hydroxyzine embonate, hydroxyzine hydrochloride, hydroxyzine pamoate, lorazepam, mephrobamate, midazolam hydrochloride, oxazepam. The at least one antipsychotic drug can be at least one selected from chlorpromazine hydrochloride, clozapine, fluphenazine decanoate, fluphenazine enanthate, fluphenazine hydrochloride, haloperidol, haloperidol decanoate, haloperidol
- 15 lactate, loxapine hydrochloride, loxapine succinate, mesoridazine besylate, molindone hydrochloride, olanzapine, perphenazine, pimozide, prochlorperazine, quetiapine fumarate, risperidone, thioridazine hydrochloride, thiothixene, thiothixene hydrochloride, trifluoperazine hydrochloride. The at least one central nervous system stimulant can be at least one selected from amphetamine sulfate, caffeine, dextroamphetamine sulfate, doxapram hydrochloride, methamphetamine hydrochloride,
- 20 methylphenidate hydrochloride, modafinil, pemoline, phentermine hydrochloride. The at least one antiparkinsonian can be at least one selected from amantadine hydrochloride, benztropine mesylate, biperiden hydrochloride, biperiden lactate, bromocriptine mesylate, carbidopa-levodopa, entacapone, levodopa, pergolide mesylate, pramipexole dihydrochloride, ropinirole hydrochloride, selegiline hydrochloride, tolcapone, trihexyphenidyl hydrochloride. The at least one miscellaneous central
- 25 nervous system drug can be at least one selected from bupropion hydrochloride, donepezil hydrochloride, droperidol, fluvoxamine maleate, lithium carbonate, lithium citrate, naratriptan hydrochloride, nicotine polacrilex, nicotine transdermal system, propofol, rizatriptan benzoate, sibutramine hydrochloride monohydrate, sumatriptan succinate, tacrine hydrochloride, zolmitriptan. (See, e.g., pp. 337-530 of *Nursing 2001 Drug Handbook*.)
- 30 The at least one cholinergic (e.g., parasympathomimetic) can be at least one selected from bethanechol chloride, edrophonium chloride, neostigmine bromide, neostigmine methylsulfate, physostigmine salicylate, pyridostigmine bromide. The at least one anticholinergics can be at least one selected from atropine sulfate, dicyclomine hydrochloride, glycopyrrolate, hyoscyamine, hyoscyamine sulfate, propantheline bromide, scopolamine, scopolamine butylbromide, scopolamine hydrobromide.
- 35 The at least one adrenergics (sympathomimetics) can be at least one selected from dobutamine hydrochloride, dopamine hydrochloride, metaraminol bitartrate, norepinephrine bitartrate, phenylephrine hydrochloride, pseudoephedrine hydrochloride, pseudoephedrine sulfate. The at least

5 one adrenergic blocker (sympatholytic) can be at least one selected from dihydroergotamine mesylate, ergotamine tartrate, methysergide maleate, propranolol hydrochloride. The at least one skeletal muscle relaxant can be at least one selected from baclofen, carisoprodol, chlorzoxazone, cyclobenzaprine hydrochloride, dantrolene sodium, methocarbamol, tizanidine hydrochloride. The at least one neuromuscular blockers can be at least one selected from atracurium besylate, cisatracurium besylate, 10 doxacurium chloride, mivacurium chloride, pancuronium bromide, pipecuronium bromide, rapacuronium bromide, rocuronium bromide, succinylcholine chloride, tubocurarine chloride, vecuronium bromide. (See, e.g., pp. 531-84 of *Nursing 2001 Drug Handbook*.)

The at least one antihistamine can be at least one selected from brompheniramine maleate, cetirizine hydrochloride, chlorpheniramine maleate, clemastine fumarate, cyproheptadine 15 hydrochloride, diphenhydramine hydrochloride, fexofenadine hydrochloride, loratadine, promethazine hydrochloride, promethazine theoclate, triprolidine hydrochloride. The at least one bronchodilators can be at least one selected from albuterol, albuterol sulfate, aminophylline, atropine sulfate, ephedrine sulfate, epinephrine, epinephrine bitartrate, epinephrine hydrochloride, ipratropium bromide, isoproterenol, isoproterenol hydrochloride, isoproterenol sulfate, levalbuterol hydrochloride, 20 metaproterenol sulfate, oxtriphylline, pirbuterol acetate, salmeterol xinafoate, terbutaline sulfate, theophylline. The at least one expectorants or antitussives can be at least one selected from benzonatate, codeine phosphate, codeine sulfate, dextromethorphan hydrobromide, diphenhydramine hydrochloride, guaifenesin, hydromorphone hydrochloride. The at least one miscellaneous respiratory drug can be at least one selected from acetylcysteine, beclomethasone dipropionate, beractant, 25 budesonide, calfactant, cromolyn sodium, dornase alfa, epoprostenol sodium, flunisolide, fluticasone propionate, montelukast sodium, nedocromil sodium, palivizumab, triamcinolone acetonide, zafirlukast, zileuton. (See, e.g., pp. 585-642 of *Nursing 2001 Drug Handbook*.)

The at least one antacid, adsorbents, or antiflatulents can be at least one selected from aluminum carbonate, aluminum hydroxide, calcium carbonate, magaldrate, magnesium hydroxide, 30 magnesium oxide, simethicone, sodium bicarbonate. The at least one digestive enzymes or gallstone solubilizers can be at least one selected from pancreatin, pancrelipase, ursodiol. The at least one antidiarrheal can be at least one selected from attapulgite, bismuth subsalicylate, calcium polycarbophil, diphenoxylate hydrochloride or atropine sulfate, loperamide, octreotide acetate, opium tincture, opium tincture (camphorated). The at least one laxative can be at least one selected from 35 bisocodyl, calcium polycarbophil, cascara sagrada, cascara sagrada aromatic fluidextract, cascara sagrada fluidextract, castor oil, docusate calcium, docusate sodium, glycerin, lactulose, magnesium citrate, magnesium hydroxide, magnesium sulfate, methylcellulose, mineral oil, polyethylene glycol or

- 5 electrolyte solution, psyllium, senna, sodium phosphates. The at least one antiemetic can be at least one selected from chlorpromazine hydrochloride, dimenhydrinate, dolasetron mesylate, dronabinol, granisetron hydrochloride, meclizine hydrochloride, metoclopramide hydrochloride, ondansetron hydrochloride, perphenazine, prochlorperazine, prochlorperazine edisylate, prochlorperazine maleate, promethazine hydrochloride, scopolamine, thiethylperazine maleate, trimethobenzamide hydrochloride.
- 10 The at least one antiulcer drug can be at least one selected from cimetidine, cimetidine hydrochloride, famotidine, lansoprazole, misoprostol, nizatidine, omeprazole, rabeprazole sodium, ranitidine bismuth citrate, ranitidine hydrochloride, sucralfate. (See, e.g., pp. 643-95 of *Nursing 2001 Drug Handbook*.)

- The at least one corticosteroids can be at least one selected from betamethasone, betamethasone acetate or betamethasone sodium phosphate, betamethasone sodium phosphate, cortisone acetate, dexamethasone, dexamethasone acetate, dexamethasone sodium phosphate, fludrocortisone acetate, hydrocortisone, hydrocortisone acetate, hydrocortisone cypionate, hydrocortisone sodium phosphate, hydrocortisone sodium succinate, methylprednisolone, methylprednisolone acetate, methylprednisolone sodium succinate, prednisolone, prednisolone acetate, prednisolone sodium phosphate, prednisolone tebutate, prednisone, triamcinolone, triamcinolone acetonide, triamcinolone diacetate. The at least one androgen or anabolic steroids can be at least one selected from danazol, fluoxymesterone, methyltestosterone, nandrolone decanoate, nandrolone phenpropionate, testosterone, testosterone cypionate, testosterone enanthate, testosterone propionate, testosterone transdermal system. The at least one estrogen or progestin can be at least one selected from esterified estrogens, estradiol, estradiol cypionate, estradiol/norethindrone acetate transdermal system, estradiol valerate, estrogens (conjugated), estropipate, ethinyl estradiol, ethinyl estradiol and desogestrel, ethinyl estradiol and ethynodiol diacetate, ethinyl estradiol and desogestrel, ethinyl estradiol and ethynodiol diacetate, ethinyl estradiol and levonorgestrel, ethinyl estradiol and norethindrone, ethinyl estradiol and norethindrone acetate, ethinyl estradiol and norgestimate, ethinyl estradiol and norgestrel, ethinyl estradiol and norethindrone and acetate and ferrous fumarate, levonorgestrel, medroxyprogesterone acetate, mestranol and norethindrone, norethindrone, norethindrone acetate, norgestrel, progesterone. The at least one gonadotropin can be at least one selected from ganirelix acetate, gonadoreline acetate, histrelin acetate, menopins. The at least one antidiabetic or glucaon can be at least one selected from acarbose, chlorpropamide, glimepiride, glipizide, glucagon, glyburide, insulins, metformin hydrochloride, miglitol, pioglitazone hydrochloride, repaglinide, rosiglitazone maleate, troglitazone. The at least one thyroid hormone can be at least one selected from levothyroxine sodium, liothyronine sodium, liotrix, thyroid. The at least one thyroid hormone antagonist can be at least one
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5 selected from methimazole, potassium iodide, potassium iodide (saturated solution), propylthiouracil, radioactive iodine (sodium iodide ¹³¹I), strong iodine solution. The at least one pituitary hormone can be at least one selected from corticotropin, cosyntropin, desmopressin acetate, leuprolide acetate, repository corticotropin, somatrem, somatropin, vasopressin. The at least one parathyroid-like drug can be at least one selected from calcifediol, calcitonin (human), calcitonin (salmon), calcitriol, 10 dihydrotachysterol, etidronate disodium. (See, e.g., pp. 696-796 of *Nursing 2001 Drug Handbook*.)

The at least one diuretic can be at least one selected from acetazolamide, acetazolamide sodium, amiloride hydrochloride, bumetanide, chlorthalidone, ethacrynate sodium, ethacrynic acid, furosemide, hydrochlorothiazide, indapamide, mannitol, metolazone, spironolactone, torsemide, triamterene, urea. The at least one electrolyte or replacement solution can be at least one selected from 15 calcium acetate, calcium carbonate, calcium chloride, calcium citrate, calcium gluconate, calcium gluceptate, calcium gluconate, calcium lactate, calcium phosphate (dibasic), calcium phosphate (tribasic), dextran (high-molecular-weight), dextran (low-molecular-weight), hetastarch, magnesium chloride, magnesium sulfate, potassium acetate, potassium bicarbonate, potassium chloride, potassium gluconate, Ringer's injection, Ringer's injection (lactated), sodium chloride. The at least one acidifier or 20 alkalizer can be at least one selected from sodium bicarbonate, sodium lactate, tromethamine. (See, e.g., pp. 797-833 of *Nursing 2001 Drug Handbook*.)

The at least one hematinic can be at least one selected from ferrous fumarate, ferrous gluconate, ferrous sulfate, ferrous sulfate (dried), iron dextran, iron sorbitol, polysaccharide-iron complex, sodium ferric gluconate complex. The at least one anticoagulant can be at least one selected 25 from ardeparin sodium, dalteparin sodium, danaparoid sodium, enoxaparin sodium, heparin calcium, heparin sodium, warfarin sodium. The at least one blood derivative can be at least one selected from albumin 5%, albumin 25%, antihemophilic factor, anti-inhibitor coagulant complex, antithrombin III (human), factor IX (human), factor IX complex, plasma protein fractions. The at least one thrombolytic enzyme can be at least one selected from alteplase, anistreplase, reteplase (recombinant), 30 streptokinase, urokinase. (See, e.g., pp. 834-66 of *Nursing 2001 Drug Handbook*.)

The at least one alkylating drug can be at least one selected from busulfan, carboplatin, carmustine, chlorambucil, cisplatin, cyclophosphamide, ifosfamide, lomustine, mechlorethamine hydrochloride, melphalan, melphalan hydrochloride, streptozocin, temozolomide, thiotepa. The at least one antimetabolite can be at least one selected from capecitabine, cladribine, cytarabine, floxuridine, 35 fludarabine phosphate, fluorouracil, hydroxyurea, mercaptopurine, methotrexate, methotrexate sodium, thioguanine. The at least one antibiotic antineoplastic can be at least one selected from bleomycin sulfate, dactinomycin, daunorubicin citrate liposomal, daunorubicin hydrochloride, doxorubicin

5 hydrochloride, doxorubicin hydrochloride liposomal, epirubicin hydrochloride, idarubicin
hydrochloride, mitomycin, pentostatin, plicamycin, valrubicin. The at least one antineoplastics that
alter hormone balance can be at least one selected from anastrozole, bicalutamide, estramustine
phosphate sodium, exemestane, flutamide, goserelin acetate, letrozole, leuprolide acetate, megestrol
10 acetate, nilutamide, tamoxifen citrate, testolactone, toremifene citrate. The at least one miscellaneous
antineoplastic can be at least one selected from asparaginase, bacillus Calmette-Guerin (BCG) (live
intravesical), dacarbazine, docetaxel, etoposide, etoposide phosphate, gemcitabine hydrochloride,
irinotecan hydrochloride, mitotane, mitoxantrone hydrochloride, paclitaxel, pegaspargase, porfimer
sodium, procarbazine hydrochloride, rituximab, teniposide, topotecan hydrochloride, trastuzumab,
15 tretinoin, vinblastine sulfate, vincristine sulfate, vinorelbine tartrate. (See, e.g., pp. 867-963 of *Nursing
2001 Drug Handbook*.)

The at least one immunosuppressant can be at least one selected from azathioprine,
basiliximab, cyclosporine, daclizumab, lymphocyte immune globulin, muromonab-CD3,
mycophenolate mofetil, mycophenolate mofetil hydrochloride, sirolimus, tacrolimus. The at least one
vaccine or toxoid can be at least one selected from BCG vaccine, cholera vaccine, diphtheria and
20 tetanus toxoids (adsorbed), diphtheria and tetanus toxoids and acellular pertussis vaccine adsorbed,
diphtheria and tetanus toxoids and whole-cell pertussis vaccine, *Haemophilus b* conjugate vaccines,
hepatitis A vaccine (inactivated), hepatitis B vaccine (recombinant), influenza virus vaccine 1999-2000
trivalent types A & B (purified surface antigen), influenza virus vaccine 1999-2000 trivalent types A &
B (subvirion or purified subvirion), influenza virus vaccine 1999-2000 trivalent types A & B (whole
25 virion), Japanese encephalitis virus vaccine (inactivated), Lyme disease vaccine (recombinant OspA),
measles and mumps and rubella virus vaccine (live), measles and mumps and rubella virus vaccine
(live attenuated), measles virus vaccine (live attenuated), meningococcal polysaccharide vaccine,
mumps virus vaccine (live), plague vaccine, pneumococcal vaccine (polyvalent), poliovirus vaccine
(inactivated), poliovirus vaccine (live, oral, trivalent), rabies vaccine (adsorbed), rabies vaccine (human
30 diploid cell), rubella and mumps virus vaccine (live), rubella virus vaccine (live, attenuated), tetanus
toxoid (adsorbed), tetanus toxoid (fluid), typhoid vaccine (oral), typhoid vaccine (parenteral), typhoid
Vi polysaccharide vaccine, varicella virus vaccine, yellow fever vaccine. The at least one antitoxin or
antivenin can be at least one selected from black widow spider antivenin, Crotalidae antivenom
(polyvalent), diphtheria antitoxin (equine), *Micrurus fulvius* antivenin). The at least one immune
35 serum can be at least one selected from cytomegalovirus immune globulin (intravenous), hepatitis B
immune globulin (human), immune globulin intramuscular, immune globulin intravenous, rabies
immune globulin (human), respiratory syncytial virus immune globulin intravenous (human), Rh₀(D)

5 immune globulin (human), Rh₀(D) immune globulin intravenous (human), tetanus immune globulin (human), varicella-zoster immune globulin. The at least one biological response modifiers can be at least one selected from aldesleukin, epoetin alfa, filgrastim, glatiramer acetate for injection, interferon alfacon-1, interferon alfa-2a (recombinant), interferon alfa-2b (recombinant), interferon beta-1a, interferon beta-1b (recombinant), interferon gamma-1b, levamisole hydrochloride, oprelvekin, 10 sargramostim. (See, e.g., pp. 964-1040 of *Nursing 2001 Drug Handbook*.)

The at least one ophthalmic anti-infectives can be selected from bacitracin, chloramphenicol, ciprofloxacin hydrochloride, erythromycin, gentamicin sulfate, ofloxacin 0.3%, polymyxin B sulfate, sulfacetamide sodium 10%, sulfacetamide sodium 15%, sulfacetamide sodium 30%, tobramycin, vidarabine. The at least one ophthalmic anti-inflammatories can be at least one selected from 15 dexamethasone, dexamethasone sodium phosphate, diclofenac sodium 0.1%, fluorometholone, flurbiprofen sodium, ketorolac tromethamine, prednisolone acetate (suspension) prednisolone sodium phosphate (solution). The at least one miotic can be at least one selected from acetylcholine chloride, carbachol (intraocular), carbachol (topical), echothiophate iodide, pilocarpine, pilocarpine hydrochloride, pilocarpine nitrate. The at least one mydriatic can be at least one selected from atropine 20 sulfate, cyclopentolate hydrochloride, epinephrine hydrochloride, epinephryl borate, homatropine hydrobromide, phenylephrine hydrochloride, scopolamine hydrobromide, tropicamide. The at least one ophthalmic vasoconstrictors can be at least one selected from naphazoline hydrochloride, oxymetazoline hydrochloride, tetrahydrozoline hydrochloride. The at least one miscellaneous ophthalmics can be at least one selected from apraclonidine hydrochloride, betaxolol hydrochloride, 25 brimonidine tartrate, carteolol hydrochloride, dipivefrin hydrochloride, dorzolamide hydrochloride, emedastine difumarate, fluorescein sodium, ketotifen fumarate, latanoprost, levobunolol hydrochloride, metipranolol hydrochloride, sodium chloride (hypertonic), timolol maleate. The at least one otic can be at least one selected from boric acid, carbamide peroxide, chloramphenicol, triethanolamine polypeptide oleate-condensate. The at least one nasal drug can be at least one selected from 30 beclomethasone dipropionate, budesonide, ephedrine sulfate, epinephrine hydrochloride, flunisolide, fluticasone propionate, naphazoline hydrochloride, oxymetazoline hydrochloride, phenylephrine hydrochloride, tetrahydrozoline hydrochloride, triamcinolone acetonide, xylometazoline hydrochloride. (See, e.g., pp. 1041-97 of *Nursing 2001 Drug Handbook*.)

The at least one local anti-infectives can be at least one selected from acyclovir, amphotericin 35 B, azelaic acid cream, bacitracin, butoconazole nitrate, clindamycin phosphate, clotrimazole, econazole nitrate, erythromycin, gentamicin sulfate, ketoconazole, mafenide acetate, metronidazole (topical), miconazole nitrate, mupirocin, naftifine hydrochloride, neomycin sulfate, nitrofurazone, nystatin, silver

5 sulfadiazine, terbinafine hydrochloride, terconazole, tetracycline hydrochloride, tioconazole, tolnaftate.
The at least one scabicide or pediculicide can be at least one selected from crothamiton, lindane,
permethrin, pyrethrins. The at least one topical corticosteroid can be at least one selected from
betamethasone dipropionate, betamethasone valerate, clobetasol propionate, desonide, desoximetasone,
dexamethasone, dexamethasone sodium phosphate, diflorasone diacetate, fluocinolone acetonide,
10 fluocinonide, flurandrenolide, fluticasone propionate, halcionide, hydrocortisone, hydrocortisone
acetate, hydrocortisone butyrate, hydrocortisone valerate, mometasone furoate, triamcinolone acetonide.
(See, e.g., pp. 1098-1136 of *Nursing 2001 Drug Handbook*.)

The at least one vitamin or mineral can be at least one selected from vitamin A, vitamin B
complex, cyanocobalamin, folic acid, hydroxocobalamin, leucovorin calcium, niacin, niacinamide,
15 pyridoxine hydrochloride, riboflavin, thiamine hydrochloride, vitamin C, vitamin D, cholecalciferol,
ergocalciferol, vitamin D analogue, doxercalciferol, paricalcitol, vitamin E, vitamin K analogue,
phytonadione, sodium fluoride, sodium fluoride (topical), trace elements, chromium, copper, iodine,
manganese, selenium, zinc. The at least one caloric can be at least one selected from amino acid
infusions (crystalline), amino acid infusions in dextrose, amino acid infusions with electrolytes, amino
20 acid infusions with electrolytes in dextrose, amino acid infusions for hepatic failure, amino acid
infusions for high metabolic stress, amino acid infusions for renal failure, dextrose, fat emulsions,
medium-chain triglycerides. (See, e.g., pp. 1137-63 of *Nursing 2001 Drug Handbook*.)

CNGH0004 antibody or polypeptide compositions of the present invention can further
comprise at least one of any suitable and/or effective amount of a composition or pharmaceutical
25 composition comprising at least one CNGH0004 protein or antibody to a cell, tissue, organ, animal or
patient in need of such modulation, treatment or therapy, optionally further comprising at least one
selected from at least one TNF antagonist (e.g., but not limited to a TNF chemical or protein
antagonist, TNF monoclonal or polyclonal antibody or fragment, a soluble TNF receptor (e.g., p55, p70
or p85) or fragment, fusion polypeptides thereof, or a small molecule TNF antagonist, e.g., TNF
30 binding protein I or II (TBP-I or TBP-II), nerelimonmab, infliximab, entercept, CDP-571, CDP-870,
afelimomab, lenercept, and the like), an antirheumatic (e.g., methotrexate, auranofin, aurothioglucose,
azathioprine, etanercept, gold sodium thiomalate, hydroxychloroquine sulfate, leflunomide,
sulfasalazine), a muscle relaxant, a narcotic, a non-steroid inflammatory drug (NSAID), an analgesic, an
anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial (e.g.,
35 aminoglycoside, an antifungal, an antiparasitic, an antiviral, a carbapenem, cephalosporin, a
flurorquinolone, a macrolide, a penicillin, a sulfonamide, a tetracycline, another antimicrobial), an
antipsoriatic, a corticosteroid, an anabolic steroid, a diabetes related agent, a mineral, a nutritional, a

5 thyroid agent, a vitamin, a calcium related hormone, an antidiarrheal, an antitussive, an antiemetic, an
antiulcer, a laxative, an anticoagulant, an erythropoietin (e.g., epoetin alpha), a filgrastim (e.g., G-CSF,
Neupogen), a sargramostim (GM-CSF, Leukine), an immunization, an immunoglobulin, an
immunosuppressive (e.g., basiliximab, cyclosporine, daclizumab), a growth hormone, a hormone
10 replacement drug, an estrogen receptor modulator, a mydriatic, a cycloplegic, an alkylating agent, an
antimetabolite, a mitotic inhibitor, a radiopharmaceutical, an antidepressant, antimanic agent, an
antipsychotic, an anxiolytic, a hypnotic, a sympathomimetic, a stimulant, donepezil, tacrine, an asthma
medication, a beta agonist, an inhaled steroid, a leukotriene inhibitor, a methylxanthine, a cromolyn, an
epinephrine or analog, dornase alpha (Pulmozyme), a cytokine or a cytokine antagonist. Non-limiting
15 examples of such cytokines include, but are not limited to, any of IL-1 to IL-23. Suitable dosages are
well known in the art. See, e.g., Wells et al., eds., *Pharmacotherapy Handbook*, 2nd Edition, Appleton
and Lange, Stamford, CT (2000); *PDR Pharmacopoeia*, Tarascon Pocket Pharmacopoeia 2000, Deluxe
Edition, Tarascon Publishing, Loma Linda, CA (2000), each of which references are entirely
incorporated herein by reference.

Such compositions can also include toxin molecules that are associated, bound, co-formulated
20 or co-administered with at least one antibody or polypeptide of the present invention. The toxin can
optionally act to selectively kill the pathologic cell or tissue. The pathologic cell can be a cancer or
other cell. Such toxins can be, but are not limited to, purified or recombinant toxin or toxin fragment
comprising at least one functional cytotoxic domain of toxin, e.g., selected from at least one of ricin,
diphtheria toxin, a venom toxin, or a bacterial toxin. The term toxin also includes both endotoxins and
25 exotoxins produced by any naturally occurring, mutant or recombinant bacteria or viruses which may
cause any pathological condition in humans and other mammals, including toxin shock, which can
result in death. Such toxins may include, but are not limited to, enterotoxigenic *E. coli* heat-labile
enterotoxin (LT), heat-stable enterotoxin (ST), *Shigella* cytotoxin, *Aeromonas* enterotoxins, toxic
shock syndrome toxin-1 (TSST-1), Staphylococcal enterotoxin A (SEA), B (SEB), or C (SEC),
30 Streptococcal enterotoxins and the like. Such bacteria include, but are not limited to, strains of a
species of enterotoxigenic *E. coli* (ETEC), enterohemorrhagic *E. coli* (e.g., strains of serotype
0157:H7), *Staphylococcus* species (e.g., *Staphylococcus aureus*, *Staphylococcus pyogenes*), *Shigella*
species (e.g., *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, and *Shigella sonnei*), *Salmonella*
species (e.g., *Salmonella typhi*, *Salmonella cholera-suis*, *Salmonella enteritidis*), *Clostridium* species
35 (e.g., *Clostridium perfringens*, *Clostridium difficile*, *Clostridium botulinum*), *Camphlobacter* species
(e.g., *Camphlobacter jejuni*, *Camphlobacter fetus*), *Heliobacter* species, (e.g., *Heliobacter pylori*),
Aeromonas species (e.g., *Aeromonas sobria*, *Aeromonas hydrophila*, *Aeromonas caviae*), *Pleisomonas*

5 *shigelloides*, *Yersinia enterocolitica*, *Vibrios* species (e.g., *Vibrios cholerae*, *Vibrios parahemolyticus*),
Klebsiella species, *Pseudomonas aeruginosa*, and *Streptococci*. See, e.g., Stein, ed., INTERNAL
MEDICINE, 3rd ed., pp 1-13, Little, Brown and Co., Boston, (1990); Evans et al., eds., Bacterial
Infections of Humans: Epidemiology and Control, 2d. Ed., pp 239-254, Plenum Medical Book Co.,
New York (1991); Mandell et al, Principles and Practice of Infectious Diseases, 3d. Ed., Churchill
10 Livingstone, New York (1990); Berkow et al, eds., *The Merck Manual*, 16th edition, Merck and Co.,
Rahway, N.J., 1992; Wood et al, FEMS Microbiology Immunology, 76:121-134 (1991); Marrack et al,
Science, 248:705-711 (1990), the contents of which references are incorporated entirely herein by
reference.

CNGH0004 antibody or polypeptide compounds, compositions or combinations of the present
15 invention can further comprise at least one of any suitable auxiliary, such as, but not limited to, diluent,
binder, stabilizer, buffers, salts, lipophilic solvents, preservative, adjuvant or the like.
Pharmaceutically acceptable auxiliaries are preferred. Non-limiting examples of, and methods of
preparing such sterile solutions are well known in the art, such as, but limited to, Gennaro, Ed.,
Remington's Pharmaceutical Sciences, 18th Edition, Mack Publishing Co. (Easton, PA) 1990.
20 Pharmaceutically acceptable carriers can be routinely selected that are suitable for the mode of
administration, solubility and/or stability of the CNGH0004 antibody or polypeptide composition as
well known in the art or as described herein.

Pharmaceutical excipients and additives useful in the present composition include but are not
limited to polypeptides, peptides, amino acids, lipids, and carbohydrates (e.g., sugars, including
25 monosaccharides, di-, tri-, tetra-, and oligosaccharides; derivatized sugars such as alditols, aldonic
acids, esterified sugars and the like; and polysaccharides or sugar polymers), which can be present
singly or in combination, comprising alone or in combination 1-99.99% by weight or volume.
Exemplary but non-limiting polypeptide excipients include serum albumin such as human serum
albumin (HSA), recombinant human albumin (rHA), gelatin, casein, and the like. Representative
30 amino acid/antibody components, which can also function in a buffering capacity, include alanine,
glycine, arginine, betaine, histidine, glutamic acid, aspartic acid, cysteine, lysine, leucine, isoleucine,
valine, methionine, phenylalanine, aspartame, and the like. One preferred amino acid is glycine.

Carbohydrate excipients suitable for use in the invention include, for example,
monosaccharides such as fructose, maltose, galactose, glucose, D-mannose, sorbose, and the like;
35 disaccharides, such as lactose, sucrose, trehalose, cellobiose, and the like; polysaccharides, such as
raffinose, melezitose, maltodextrins, dextrans, starches, and the like; and alditols, such as mannitol,
xylitol, maltitol, lactitol, xylitol sorbitol (glucitol), myoinositol and the like. Preferred carbohydrate

5 excipients for use in the present invention are mannitol, trehalose, and raffinose.

CNGH0004 antibody or polypeptide compositions can also include a buffer or a pH adjusting agent; typically, the buffer is a salt prepared from an organic acid or base. Representative buffers include organic acid salts such as salts of citric acid, ascorbic acid, gluconic acid, carbonic acid, tartaric acid, succinic acid, acetic acid, or phthalic acid; Tris, tromethamine hydrochloride, or
10 phosphate buffers. Preferred buffers for use in the present compositions are organic acid salts such as citrate.

Additionally, CNGH0004 antibody or polypeptide compositions of the invention can include polymeric excipients/additives such as polyvinylpyrrolidones, ficolls (a polymeric sugar), dextrans (e.g., cyclodextrins, such as 2-hydroxypropyl- β -cyclodextrin), polyethylene glycols, flavoring agents,
15 antimicrobial agents, sweeteners, antioxidants, antistatic agents, surfactants (e.g., polysorbates such as "TWEEN 20" and "TWEEN 80"), lipids (e.g., phospholipids, fatty acids), steroids (e.g., cholesterol), and chelating agents (e.g., EDTA).

These and additional known pharmaceutical excipients and/or additives suitable for use in the CNGH0004 antibody or polypeptide compositions according to the invention are known in the art, e.g.,
20 as listed in "Remington: The Science & Practice of Pharmacy", 19th ed., Williams & Williams, (1995), and in the "Physician's Desk Reference", 52nd ed., Medical Economics, Montvale, NJ (1998), the disclosures of which are entirely incorporated herein by reference. Preferred carrier or excipient materials are carbohydrates (e.g., saccharides and alditols) and buffers (e.g., citrate) or polymeric agents.

25 Formulations

As noted above, the invention provides for stable formulations, which is preferably a phosphate buffer with saline or a chosen salt, as well as preserved solutions and formulations containing a preservative as well as multi-use preserved formulations suitable for pharmaceutical or veterinary use, comprising at least one CNGH0004 antibody or polypeptide in a pharmaceutically
30 acceptable formulation. Preserved formulations contain at least one known preservative or optionally selected from the group consisting of at least one phenol, m-cresol, p-cresol, o-cresol, chlorocresol, benzyl alcohol, phenylmercuric nitrite, phenoxyethanol, formaldehyde, chlorobutanol, magnesium chloride (e.g., hexahydrate), alkylparaben (methyl, ethyl, propyl, butyl and the like), benzalkonium chloride, benzethonium chloride, sodium dehydroacetate and thimerosal, or mixtures thereof in an
35 aqueous diluent. Any suitable concentration or mixture can be used as known in the art, such as 0.001-5%, or any range or value therein, such as, but not limited to 0.001, 0.003, 0.005, 0.009, 0.01, 0.02, 0.03, 0.05, 0.09, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9,

5 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.3, 4.5,
4.6, 4.7, 4.8, 4.9, or any range or value therein. Non-limiting examples include, no preservative, 0.1-
2% m-cresol (e.g., 0.2, 0.3, 0.4, 0.5, 0.9, 1.0%), 0.1-3% benzyl alcohol (e.g., 0.5, 0.9, 1.1, 1.5, 1.9, 2.0,
2.5%), 0.001-0.5% thimerosal (e.g., 0.005, 0.01), 0.001-2.0% phenol (e.g., 0.05, 0.25, 0.28, 0.5, 0.9,
1.0%), 0.0005-1.0% alkylparaben(s) (e.g., 0.00075, 0.0009, 0.001, 0.002, 0.005, 0.0075, 0.009, 0.01,
10 0.02, 0.05, 0.075, 0.09, 0.1, 0.2, 0.3, 0.5, 0.75, 0.9, 1.0%), and the like.

As noted above, the invention provides an article of manufacture, comprising
packaging material and at least one vial comprising a solution of at least one CNGH0004 antibody or
polypeptide with the prescribed buffers and/or preservatives, optionally in an aqueous diluent, wherein
said packaging material comprises a label that indicates that such solution can be held over a period of
15 1, 2, 3, 4, 5, 6, 9, 12, 18, 20, 24, 30, 36, 40, 48, 54, 60, 66, 72 hours or greater. The invention further
comprises an article of manufacture, comprising packaging material, a first vial comprising lyophilized
at least one CNGH0004 antibody or polypeptide, and a second vial comprising an aqueous diluent of
prescribed buffer or preservative, wherein said packaging material comprises a label that instructs a
patient to reconstitute the at least one CNGH0004 antibody or polypeptide in the aqueous diluent to
20 form a solution that can be held over a period of twenty-four hours or greater.

The at least one CNGH0004 antibody or polypeptide used in accordance with the present
invention can be produced by recombinant means, including from mammalian cell or transgenic
preparations, or can be purified from other biological sources, as described herein or as known in the
art.

25 The range of at least one CNGH0004 antibody in at least one product of the present invention
includes amounts yielding upon reconstitution, if in a wet/dry system, concentrations from about 1.0
ng/ml to about 1000 mg/ml, although lower and higher concentrations are operable and are dependent
on the intended delivery vehicle, e.g., solution formulations will differ from transdermal patch,
pulmonary, transmucosal, or osmotic or micro pump methods.

30 The range of at least one CNGH0004 antibody in at least one product of the present invention
includes amounts yielding upon reconstitution, if in a wet/dry system, concentrations from about 1.0
 $\mu\text{g/ml}$ to about 1000 mg/ml, although lower and higher concentrations are operable and are dependent
on the intended delivery vehicle, e.g., solution formulations will differ from transdermal patch,
pulmonary, transmucosal, or osmotic or micro pump methods.

35 Preferably, the aqueous diluent optionally further comprises a pharmaceutically acceptable
preservative. Preferred preservatives include those selected from the group consisting of phenol, m-
cresol, p-cresol, o-cresol, chlorocresol, benzyl alcohol, alkylparaben (methyl, ethyl, propyl, butyl and

5 the like), benzalkonium chloride, benzethonium chloride, sodium dehydroacetate and thimerosal, or mixtures thereof. The concentration of preservative used in the formulation is a concentration sufficient to yield an microbial effect. Such concentrations are dependent on the preservative selected and are readily determined by the skilled artisan.

10 Other excipients, e.g. isotonicity agents, buffers, antioxidants, preservative enhancers, can be optionally and preferably added to the diluent. An isotonicity agent, such as glycerin, is commonly used at known concentrations. A physiologically tolerated buffer is preferably added to provide improved pH control. The formulations can cover a wide range of pHs, such as from about pH 4 to about pH 10, and preferred ranges from about pH 5 to about pH 9, and a most preferred range of about 15 6.0 to about 8.0. Preferably the formulations of the present invention have pH between about 6.8 and about 7.8. Preferred buffers include phosphate buffers, most preferably sodium phosphate, particularly phosphate buffered saline (PBS).

Other additives, such as a pharmaceutically acceptable solubilizers like Tween 20 (polyoxyethylene (20) sorbitan monolaurate), Tween 40 (polyoxyethylene (20) sorbitan monopalmitate), Tween 80 (polyoxyethylene (20) sorbitan monooleate), Pluronic F68 20 (polyoxyethylene polyoxypropylene block copolymers), and PEG (polyethylene glycol) or non-ionic surfactants such as polysorbate 20 or 80 or poloxamer 184 or 188, Pluronic® polylys, other block co-polymers, and chelators such as EDTA and EGTA can optionally be added to the formulations or compositions to reduce aggregation. These additives are particularly useful if a pump or plastic container is used to administer the formulation. The presence of pharmaceutically acceptable 25 surfactant mitigates the propensity for the polypeptide to aggregate.

The formulations of the present invention can be prepared by a process which comprises mixing at least one CNGH0004 antibody or polypeptide and a preservative selected from the group consisting of phenol, m-cresol, p-cresol, o-cresol, chlorocresol, benzyl alcohol, alkylparaben, (methyl, ethyl, propyl, butyl and the like), benzalkonium chloride, benzethonium chloride, sodium 30 dehydroacetate and thimerosal or mixtures thereof in an aqueous diluent. Mixing the at least one CNGH0004 antibody or polypeptide and preservative in an aqueous diluent is carried out using conventional dissolution and mixing procedures. To prepare a suitable formulation, for example, a measured amount of at least one CNGH0004 antibody or polypeptide in buffered solution is combined with the desired preservative in a buffered solution in quantities sufficient to provide the polypeptide 35 and preservative at the desired concentrations. Variations of this process would be recognized by one of ordinary skill in the art. For example, the order the components are added, whether additional additives are used, the temperature and pH at which the formulation is prepared, are all factors that can

5 be optimized for the concentration and means of administration used.

The claimed formulations can be provided to patients as clear solutions or as dual vials comprising a vial of lyophilized at least one CNGH0004 antibody or polypeptide that is reconstituted with a second vial containing water, a preservative and/or excipients, preferably a phosphate buffer and/or saline and a chosen salt, in an aqueous diluent. Either a single solution vial or dual vial
10 requiring reconstitution can be reused multiple times and can suffice for a single or multiple cycles of patient treatment and thus can provide a more convenient treatment regimen than currently available.

The present claimed articles of manufacture are useful for administration over a period of immediately to twenty-four hours or greater. Accordingly, the presently claimed articles of manufacture offer significant advantages to the patient. Formulations of the invention can optionally be
15 safely stored at temperatures of from about 2 to about 40°C and retain the biological activity of the polypeptide for extended periods of time, thus, allowing a package label indicating that the solution can be held and/or used over a period of 6, 12, 18, 24, 36, 48, 72, or 96 hours or greater. If preserved diluent is used, such label can include use up to 1-12 months, one-half, one and a half, and/or two years.

20 The solutions of at least one CNGH0004 antibody or polypeptide in the invention can be prepared by a process that comprises mixing at least one antibody or polypeptide in an aqueous diluent. Mixing is carried out using conventional dissolution and mixing procedures. To prepare a suitable diluent, for example, a measured amount of at least one antibody or polypeptide in water or buffer is combined in quantities sufficient to provide the polypeptide and optionally a preservative or
25 buffer at the desired concentrations. Variations of this process would be recognized by one of ordinary skill in the art. For example, the order the components are added, whether additional additives are used, the temperature and pH at which the formulation is prepared, are all factors that can be optimized for the concentration and means of administration used.

The claimed products can be provided to patients as clear solutions or as dual vials
30 comprising a vial of lyophilized at least one CNGH0004 antibody or polypeptide that is reconstituted with a second vial containing the aqueous diluent. Either a single solution vial or dual vial requiring reconstitution can be reused multiple times and can suffice for a single or multiple cycles of patient treatment and thus provides a more convenient treatment regimen than currently available.

The claimed products can be provided indirectly to patients by providing to
35 pharmacies, clinics, or other such institutions and facilities, clear solutions or dual vials comprising a vial of lyophilized at least one CNGH0004 antibody or polypeptide that is reconstituted with a second vial containing the aqueous diluent. The clear solution in this case can be up to one liter or even larger

5 in size, providing a large reservoir from which smaller portions of the at least one antibody or polypeptide solution can be retrieved one or multiple times for transfer into smaller vials and provided by the pharmacy or clinic to their customers and/or patients.

Recognized devices comprising these single vial systems include those pen-injector devices for delivery of a solution such as BD Pens, BD Autojector[®], Humaject[®], NovoPen[®], B-D[®]Pen, 10 AutoPen[®], and OptiPen[®], GenotropinPen[®], Genotronorm Pen[®], Humatro Pen[®], Reco-Pen[®], Roferon Pen[®], Biojector[®], iject[®], J-tip Needle-Free Injector[®], Intraject[®], Medi-Ject[®], e.g., as made or developed by Becton Dickenson (Franklin Lakes, NJ, www.bectondickenson.com), Disetronic (Burgdorf, Switzerland, www.disetronic.com); Bioject, Portland, Oregon (www.bioject.com); National Medical Products, Weston Medical (Peterborough, UK, www.weston-medical.com), Medi-Ject Corp 15 (Minneapolis, MN, www.mediject.com). Recognized devices comprising a dual vial system include those pen-injector systems for reconstituting a lyophilized drug in a cartridge for delivery of the reconstituted solution such as the HumatroPen[®].

The products presently claimed include packaging material. The packaging material provides, in addition to the information required by the regulatory agencies, the conditions under which 20 the product can be used. The packaging material of the present invention provides instructions to the patient to reconstitute the at least one CNGH0004 antibody or polypeptide in the aqueous diluent to form a solution and to use the solution over a period of 2-24 hours or greater for the two vial, wet/dry, product. For the single vial, solution product, the label indicates that such solution can be used over a period of 2-24 hours or greater. The presently claimed products are useful for human pharmaceutical 25 product use.

The formulations of the present invention can be prepared by a process that comprises mixing at least one CNGH0004 antibody or polypeptide and a selected buffer, preferably a phosphate buffer containing saline or a chosen salt. Mixing the at least one antibody or polypeptide and buffer in an aqueous diluent is carried out using conventional dissolution and mixing procedures. To prepare a 30 suitable formulation, for example, a measured amount of at least one antibody or polypeptide in water or buffer is combined with the desired buffering agent in water in quantities sufficient to provide the polypeptide and buffer at the desired concentrations. Variations of this process would be recognized by one of ordinary skill in the art. For example, the order the components are added, whether additional additives are used, the temperature and pH at which the formulation is prepared, are all 35 factors that can be optimized for the concentration and means of administration used.

The claimed stable or preserved formulations can be provided to patients as clear solutions or as dual vials comprising a vial of lyophilized at least one CNGH0004 antibody or

5 polypeptide that is reconstituted with a second vial containing a preservative or buffer and excipients in an aqueous diluent. Either a single solution vial or dual vial requiring reconstitution can be reused multiple times and can suffice for a single or multiple cycles of patient treatment and thus provides a more convenient treatment regimen than currently available.

At least one CNGH0004 antibody or polypeptide in either the stable or preserved formulations
10 or solutions described herein, can be administered to a patient in accordance with the present invention via a variety of delivery methods including SC or IM injection; transdermal, pulmonary, transmucosal, implant, osmotic pump, cartridge, micro pump, or other means appreciated by the skilled artisan, as well-known in the art.

Therapeutic Applications

15 The present invention also provides a method for modulating or treating at least one CNGH0004 related disease, in a cell, tissue, organ, animal, or patient, as known in the art or as described herein, using at least one antibody or polypeptide of the present invention.

The present invention also provides a method for modulating or treating at least one CNGH0004 related disease, in a cell, tissue, organ, animal, or patient including, but not limited to, at
20 least one of obesity, an immune related disease, a cardiovascular disease, an infectious disease, a malignant disease or a neurologic disease.

The present invention also provides a method for modulating or treating at least one adult or pediatric immune or inflammation related disease, in a cell, tissue, organ, animal, or patient including, but not limited to, at least one of, or at least one inflammation related to, rheumatoid arthritis, juvenile
25 rheumatoid arthritis, systemic onset juvenile rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, gastric ulcer, seronegative arthropathies, osteoarthritis, inflammatory bowel disease, ulcerative colitis, Crohn's disease, systemic lupus erythematosus, antiphospholipid syndrome, iridocyclitis, uveitis, optic neuritis, idiopathic pulmonary fibrosis, systemic vasculitis, Wegener's granulomatosis, sarcoidosis, orchitis, vasectomy or vasectomy reversal procedures, allergic atopic
30 diseases, asthma, allergic rhinitis, eczema, allergic contact dermatitis, allergic conjunctivitis, hypersensitivity pneumonitis, transplants, organ transplant rejection, graft-versus-host disease, systemic inflammatory response syndrome, sepsis syndrome, gram positive sepsis, gram negative sepsis, culture negative sepsis, fungal sepsis, neutropenic fever, urosepsis, meningococcemia, trauma, hemorrhage, burns, ionizing radiation exposure, acute pancreatitis, adult respiratory distress syndrome,
35 rheumatoid arthritis, alcohol-induced hepatitis, chronic inflammatory pathologies, sarcoidosis, Crohn's pathology, sickle cell anemia, type I or type II diabetes, nephrosis, atopic diseases, hypersensitivity

5 reactions, allergic rhinitis, hay fever, perennial rhinitis, conjunctivitis, endometriosis, asthma, urticaria, systemic anaphalaxis, dermatitis, pernicious anemia, hemolytic disease, thrombocytopenia, graft
rejection of any organ or tissue, kidney transplant rejection, heart transplant rejection, liver transplant
rejection, pancreas transplant rejection, lung transplant rejection, bone marrow transplant (BMT)
rejection, skin allograft rejection, cartilage transplant rejection, bone graft rejection, small bowel
10 transplant rejection, fetal thymus implant rejection, parathyroid transplant rejection, xenograft rejection
of any organ or tissue, allograft rejection, receptor hypersensitivity reactions, chronic obstructive
pulmonary disease (COPD), Graves disease, Raynaud's disease, type B insulin-resistant diabetes,
asthma, myasthenia gravis, antibody-mediated cytotoxicity, gene therapy inflammation (e.g.,
adenovirus, AAV, vaccinia, DNA or RNA, Moloney murine leukemia virus (MMLV) and the like),
15 type III hypersensitivity reactions, systemic lupus erythematosus, POEMS syndrome (polyneuropathy,
organomegaly, endocrinopathy, monoclonal gammopathy, and skin changes syndrome),
polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy, skin changes syndrome,
antiphospholipid syndrome, pemphigus, scleroderma, mixed connective tissue disease, idiopathic
Addison's disease, diabetes mellitus, chronic active hepatitis, primary biliary cirrhosis, vitiligo,
20 vasculitis, post-MI cardiomyopathy syndrome, type IV hypersensitivity, contact dermatitis, hypersensitivity
pneumonitis, allograft rejection, granulomas due to intracellular organisms, drug sensitivity, metabolic,
idiopathic, Wilson's disease, hemochromatosis, alpha-1-antitrypsin deficiency, diabetic retinopathy,
Hashimoto's thyroiditis, osteoporosis, hypothalamic-pituitary-adrenal axis evaluation, primary biliary
cirrhosis, thyroiditis, encephalomyelitis, cachexia, cystic fibrosis, neonatal chronic lung disease,
25 chronic obstructive pulmonary disease (COPD), familial hemophagocytic lymphohistiocytosis,
dermatologic conditions, psoriasis, alopecia, nephrotic syndrome, nephritis, glomerular nephritis, acute
renal failure, hemodialysis, uremia, toxicity, preeclampsia, OKT3 therapy, CD3 therapy, cytokine therapy,
chemotherapy, radiation therapy (e.g., including but not limited to thymosthenia, anemia, cachexia, and the
like), chronic salicylate intoxication, and the like. See, e.g., the Merck Manual, 12th-17th Editions,
30 Merck & Company, Rahway, NJ (1972, 1977, 1982, 1987, 1992, 1999), Pharmacotherapy Handbook,
Wells et al., eds., Second Edition, Appleton and Lange, Stamford, Conn. (1998, 2000), each entirely
incorporated by reference.

The present invention also provides a method for modulating or treating at least one
cardiovascular disease in a cell, tissue, organ, animal, or patient, including, but not limited to, at least
35 one of cardiac stun syndrome, myocardial infarction, congestive heart failure, stroke, ischemic stroke,
hemorrhage, arteriosclerosis, atherosclerosis, restenosis, diabetic arteriosclerotic disease, hypertension,
arterial hypertension, renovascular hypertension, syncope, shock, syphilis of the cardiovascular system,

5 heart failure, cor pulmonale, primary pulmonary hypertension, cardiac arrhythmias, atrial ectopic beats, atrial flutter, atrial fibrillation (sustained or paroxysmal), post perfusion syndrome, cardiopulmonary bypass inflammation response, chaotic or multifocal atrial tachycardia, regular narrow QRS tachycardia, specific arrhythmias, ventricular fibrillation, His bundle arrhythmias, atrioventricular block, bundle branch block, myocardial ischemic disorders, coronary artery disease, angina pectoris, 10 myocardial infarction, cardiomyopathy, dilated congestive cardiomyopathy, restrictive cardiomyopathy, valvular heart diseases, endocarditis, pericardial disease, cardiac tumors, aortic and peripheral aneurysms, aortic dissection, inflammation of the aorta, occlusion of the abdominal aorta and its branches, peripheral vascular disorders, occlusive arterial disorders, peripheral atherosclerotic disease, thromboangitis obliterans, functional peripheral arterial disorders, Raynaud's phenomenon and 15 disease, acrocyanosis, erythromelalgia, venous diseases, venous thrombosis, varicose veins, arteriovenous fistula, lymphedema, lipedema, unstable angina, reperfusion injury, post pump syndrome, ischemia-reperfusion injury, and the like. Such a method can optionally comprise administering an effective amount of a composition or pharmaceutical composition comprising at least one CNGH0004 antibody or polypeptide to a cell, tissue, organ, animal or patient in need of such 20 modulation, treatment or therapy.

The present invention also provides a method for modulating or treating at least one infectious disease in a cell, tissue, organ, animal or patient, including, but not limited to, at least one of: acute or chronic infection, acute and chronic parasitic or infectious processes, including bacterial, viral and fungal infections, HIV infection, HIV neuropathy, meningitis, hepatitis (A,B or C, or the like), septic 25 arthritis, peritonitis, pneumonia, epiglottitis, e. coli 0157:h7, hemolytic uremic syndrome, thrombolytic thrombocytopenic purpura, malaria, dengue hemorrhagic fever, leishmaniasis, leprosy, toxic shock syndrome, streptococcal myositis, gas gangrene, mycobacterium tuberculosis, mycobacterium avium intracellulare, pneumocystis carinii pneumonia, pelvic inflammatory disease, orchitis, epididymitis, legionella, lyme disease, influenza a, epstein-barr virus, vital-associated hemaphagocytic syndrome, 30 vital encephalitis, aseptic meningitis, and the like. Such toxins can be, but are not limited to, purified or recombinant toxin or toxin fragment comprising at least one functional cytotoxic domain of toxin, e.g., selected from at least one of diphtheria toxin, a venom toxin, a viral toxin or a bacterial toxin. The term toxin also includes both endotoxins and exotoxins produced by any naturally occurring, mutant or recombinant bacteria or viruses which may cause any pathological condition in humans and other 35 mammals, including toxin shock, which can result in death. Such toxins may include, but are not limited to, enterotoxigenic *E. coli* heat-labile enterotoxin (LT), heat-stable enterotoxin (ST), *Shigella* cytotoxin, *Aeromonas* enterotoxins, toxic shock syndrome toxin-1 (TSST-1), Staphylococcal

5 enterotoxin A (SEA), B (SEB), or C (SEC), Streptococcal enterotoxins anthrax endotoxin, and the like. Such bacteria include, but are not limited to, gram negative or gram positive bacteria, *Bacillus*, *E. coli*, *Streptococcus*, *Staphylococcus*, *Shigella*, *Salmonella*, *Clostridium*, *Camphobacter*, *Heliobacter*, *Aeromonas*, *Enterococcus*, *Pseudomonas*, and the like, such as but not limited to, strains of a species of enterotoxigenic *E. coli* (ETEC), enterohemorrhagic *E. coli* (e.g., strains of serotype 0157:H7),
10 *Staphylococcus* species (e.g., *Staphylococcus aureus*, *Staphylococcus pyogenes*), *Shigella* species (e.g., *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, and *Shigella sonnei*), *Salmonella* species (e.g., *Salmonella typhi*, *Salmonella cholera-suis*, *Salmonella enteritidis*), *Clostridium* species (e.g., *Clostridium perfringens*, *Clostridium difficile*, *Clostridium botulinum*), *Camphobacter* species (e.g., *Camphobacter jejuni*, *Camphobacter fetus*), *Heliobacter* species, (e.g., *Heliobacter pylori*),
15 *Aeromonas* species (e.g., *Aeromonas sobria*, *Aeromonas hydrophila*, *Aeromonas caviae*), *Pleisomonas shigelloides*, *Yersina enterocolitica*, *Vibrios* species (e.g., *Vibrios cholerae*, *Vibrios parahemolyticus*), *Klebsiella* species, *Pseudomonas aeruginosa*, and *Streptococci*. See, e.g., Stein, ed., INTERNAL MEDICINE, 3rd ed., pp 1-13, Little, Brown and Co., Boston, (1990); Evans et al., eds., Bacterial Infections of Humans: Epidemiology and Control, 2d. Ed., pp 239-254, Plenum Medical Book Co.,
20 New York (1991); Mandell et al, *Principles and Practice of Infectious Diseases*, 3d. Ed., Churchill Livingstone, New York (1990); Berkow et al, eds., *The Merck Manual*, 16th edition, Merck and Co., Rahway, N.J., 1992; Wood et al, *FEMS Microbiology Immunology*, 76:121-134 (1991); Marrack et al, *Science*, 248:705-711 (1990), the contents of which references are incorporated entirely herein by reference. Such a method can optionally comprise administering an effective amount of a composition
25 or pharmaceutical composition comprising at least one CNGH0004 antibody or polypeptide to a cell, tissue, organ, animal or patient in need of such modulation, treatment or therapy.

The present invention also provides a method for modulating or treating at least one malignant disease in a cell, tissue, organ, animal or patient, including, but not limited to, at least one of: leukemia, acute leukemia, acute lymphoblastic leukemia (ALL), acute lymphocytic leukemia, B-cell, T-cell or
30 FAB ALL, acute myeloid leukemia (AML), acute myelogenous leukemia, chronic myelocytic leukemia (CML), chronic lymphocytic leukemia (CLL), hairy cell leukemia, myelodysplastic syndrome (MDS), a lymphoma, Hodgkin's disease, a malignant lymphoma, non-hodgkin's lymphoma, Burkitt's lymphoma, multiple myeloma, Kaposi's sarcoma, colorectal carcinoma, pancreatic carcinoma, nasopharyngeal carcinoma, malignant histiocytosis, paraneoplastic syndrome/hypercalcemia of
35 malignancy, solid tumors, bladder cancer, breast cancer, colorectal cancer, endometrial cancer, head cancer, neck cancer, hereditary nonpolyposis cancer, Hodgkin's lymphoma, liver cancer, lung cancer, non-small cell lung cancer, ovarian cancer, pancreatic cancer, prostate cancer, renal cell carcinoma,

5 testicular cancer, adenocarcinomas, sarcomas, malignant melanoma, hemangioma, metastatic disease, cancer related bone resorption, cancer related bone pain, and the like.

Such a method can optionally comprise administering an effective amount of a composition or pharmaceutical composition comprising at least one CNGH0004 antibody or polypeptide to a cell, tissue, organ, animal or patient in need of such modulation, treatment or therapy.

10 The present invention also provides a method for modulating or treating at least one neurologic disease in a cell, tissue, organ, animal or patient, including, but not limited to, at least one of: neurodegenerative diseases, multiple sclerosis, migraine headache, AIDS dementia complex, demyelinating diseases, such as multiple sclerosis and acute transverse myelitis; extrapyramidal and cerebellar disorders' such as lesions of the corticospinal system; disorders of the basal ganglia or
15 cerebellar disorders; hyperkinetic movement disorders such as Huntington's Chorea and senile chorea; drug-induced movement disorders, such as those induced by drugs which block CNS dopamine receptors; hypokinetic movement disorders, such as Parkinson's disease; Progressive supranucleo Palsy; structural lesions of the cerebellum; spinocerebellar degenerations, such as spinal ataxia, Friedreich's ataxia, cerebellar cortical degenerations, multiple systems degenerations (Mencel,
20 Dejerine-Thomas, Shi-Drager, and Machado-Joseph); systemic disorders (Refsum's disease, abetalipoproteinemia, ataxia, telangiectasia, and mitochondrial multi.system disorder); demyelinating core disorders, such as multiple sclerosis, acute transverse myelitis; and disorders of the motor unit' such as neurogenic muscular atrophies (anterior horn cell degeneration, such as amyotrophic lateral sclerosis, infantile spinal muscular atrophy and juvenile spinal muscular atrophy); Alzheimer's disease; Down's
25 Syndrome in middle age; Diffuse Lewy body disease; Senile Dementia of Lewy body type; Wernicke-Korsakoff syndrome; chronic alcoholism; Creutzfeldt-Jakob disease; Subacute sclerosing panencephalitis, Hallerrorden-Spatz disease; and Dementia pugilistica, and the like. Such a method can optionally comprise administering an effective amount of a composition or pharmaceutical composition comprising at least one CNGH0004 antibody or polypeptide to a cell, tissue, organ,
30 animal or patient in need of such modulation, treatment or therapy. See, e.g., the Merck Manual, 16th Edition, Merck & Company, Rahway, NJ (1992).

Any method of the present invention can comprise administering an effective amount of a composition or pharmaceutical composition comprising at least one CNGH0004 antibody or polypeptide to a cell, tissue, organ, animal or patient in need of such modulation, treatment or therapy.

35 Such a method can optionally further comprise co-administration or combination therapy for treating such diseases, wherein the administering of said at least one CNGH0004 antibody or polypeptide, specified portion or variant thereof, further comprises administering, before concurrently, and/or after,

5 at least one selected from at least one TNF antagonist (e.g., but not limited to a TNF chemical or
protein antagonist, TNF monoclonal or polyclonal antibody or fragment, a soluble TNF receptor (e.g.,
p55, p70 or p85) or fragment, fusion polypeptides thereof, or a small molecule TNF antagonist, e.g.,
TNF binding protein I or II (TBP-I or TBP-II), nerelimonmab, infliximab, entercept, CDP-571, CDP-
870, afelimomab, lenercept, and the like), an antirheumatic (e.g., methotrexate, auranofin,
10 aurothioglucose, azathioprine, etanercept, gold sodium thiomalate, hydroxychloroquine sulfate,
leflunomide, sulfasalazine), a muscle relaxant, a narcotic, a non-steroid inflammatory drug (NSAID), an
analgesic, an anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial (e.g.,
aminoglycoside, an antifungal, an antiparasitic, an antiviral, a carbapenem, cephalosporin, a
flurorquinolone, a macrolide, a penicillin, a sulfonamide, a tetracycline, another antimicrobial), an
15 antipsoriatic, a corticosteroid, an anabolic steroid, a diabetes related agent, a mineral, a nutritional, a
thyroid agent, a vitamin, a calcium related hormone, an antidiarrheal, an antitussive, an antiemetic, an
antiulcer, a laxative, an anticoagulant, an erythropoietin (e.g., epoetin alpha), a filgrastim (e.g., G-CSF,
Neupogen), a sargramostim (GM-CSF, Leukine), an immunization, an immunoglobulin, an
immunosuppressive (e.g., basiliximab, cyclosporine, daclizumab), a growth hormone, a hormone
20 replacement drug, an estrogen receptor modulator, a mydriatic, a cycloplegic, an alkylating agent, an
antimetabolite, a mitotic inhibitor, a radiopharmaceutical, an antidepressant, antimanic agent, an
antipsychotic, an anxiolytic, a hypnotic, a sympathomimetic, a stimulant, donepezil, tacrine, an asthma
medication, a beta agonist, an inhaled steroid, a leukotriene inhibitor, a methylxanthine, a cromolyn, an
epinephrine or analog, dornase alpha (Pulmozyme), a cytokine or a cytokine antagonist. Suitable
25 dosages are well known in the art. See, e.g., Wells et al., eds., *Pharmacotherapy Handbook*, 2nd
Edition, Appleton and Lange, Stamford, CT (2000); *PDR Pharmacopoeia*, Tarascon Pocket
Pharmacopoeia 2000, Deluxe Edition, Tarascon Publishing, Loma Linda, CA (2000), each of which
references are entirely incorporated herein by reference.

TNF antagonists suitable for compositions, combination therapy, co-administration, devices
30 and/or methods of the present invention (further comprising at least one anti body, specified portion
and variant thereof, of the present invention), include, but are not limited to, TNF antibodies, antigen-
binding fragments thereof, and receptor molecules which bind specifically to TNF; compounds which
prevent and/or inhibit TNF synthesis, TNF release or its action on target cells, such as thalidomide,
tenidap, phosphodiesterase inhibitors (e.g. pentoxifylline and rolipram), A2b adenosine receptor
35 agonists and A2b adenosine receptor enhancers; compounds which prevent and/or inhibit TNF receptor
signalling, such as mitogen activated polypeptide (MAP) kinase inhibitors; compounds which block
and/or inhibit membrane TNF cleavage, such as metallopolypeptidease inhibitors; compounds which

5 block and/or inhibit TNF activity, such as angiotensin converting enzyme (ACE) inhibitors (e.g., captopril); and compounds which block and/or inhibit TNF production and/or synthesis, such as MAP kinase inhibitors.

As used herein, a "tumor necrosis factor antibody," "TNF antibody," "TNF α antibody," or fragment and the like decreases, blocks, inhibits, abrogates or interferes with TNF α activity *in vitro*, *in situ* and/or preferably *in vivo*. For example, a suitable TNF human antibody of the present invention
10 can bind TNF α and includes TNF antibodies, antigen-binding fragments thereof, and specified mutants or domains thereof that bind specifically to TNF α . A suitable TNF antibody or fragment can also decrease block, abrogate, interfere, prevent and/or inhibit TNF RNA, DNA or polypeptide synthesis, TNF release, TNF receptor signaling, membrane TNF cleavage, TNF activity, TNF production and/or
15 synthesis.

Chimeric antibody cA2 consists of the antigen binding variable region of the high-affinity neutralizing mouse human TNF α IgG1 antibody, designated A2, and the constant regions of a human IgG1, kappa immunoglobulin. The human IgG1 Fc region improves allogeneic antibody effector function, increases the circulating serum half-life and decreases the immunogenicity of the antibody.
20 The avidity and epitope specificity of the chimeric antibody cA2 is derived from the variable region of the murine antibody A2. In a particular embodiment, a preferred source for nucleic acids encoding the variable region of the murine antibody A2 is the A2 hybridoma cell line.

Chimeric A2 (cA2) neutralizes the cytotoxic effect of both natural and recombinant human TNF α in a dose dependent manner. From binding assays of chimeric antibody cA2 and recombinant
25 human TNF α , the affinity constant of chimeric antibody cA2 was calculated to be $1.04 \times 10^{10} \text{M}^{-1}$. Preferred methods for determining monoclonal antibody specificity and affinity by competitive inhibition can be found in Harlow, *et al.*, *antibodies: A Laboratory Manual*, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York, 1988; Colligan *et al.*, eds., *Current Protocols in Immunology*, Greene Publishing Assoc. and Wiley Interscience, New York, (1992-2000); Kozbor *et al.*, *Immunol. Today*, 4:72-79 (1983); Ausubel *et al.*, eds. *Current Protocols in Molecular Biology*, Wiley Interscience, New York (1987-2000); and Muller, *Meth. Enzymol.*, 92:589-601 (1983), which references are entirely incorporated herein by reference.

In a particular embodiment, murine monoclonal antibody A2 is produced by a cell line designated c134A. Chimeric antibody cA2 is produced by a cell line designated c168A.

35 Additional examples of monoclonal TNF antibodies that can be used in the present invention are described in the art (see, e.g., U.S. Patent No. 5,231,024; Möller, A. *et al.*, *Cytokine* 2(3):162-169 (1990); U.S. Application No. 07/943,852 (filed September 11, 1992); Rathjen *et al.*, International

5 Publication No. WO 91/02078 (published February 21, 1991); Rubin *et al.*, EPO Patent Publication
No. 0 218 868 (published April 22, 1987); Yone *et al.*, EPO Patent Publication No. 0 288 088 (October
26, 1988); Liang, *et al.*, *Biochem. Biophys. Res. Comm.* 137:847-854 (1986); Meager, *et al.*,
Hybridoma 6:305-311 (1987); Fendly *et al.*, *Hybridoma* 6:359-369 (1987); Bringman, *et al.*,
Hybridoma 6:489-507 (1987); and Hirai, *et al.*, *J. Immunol. Meth.* 96:57-62 (1987), which references
10 are entirely incorporated herein by reference).

TNF Receptor Molecules

Preferred TNF receptor molecules useful in the present invention are those that bind TNF α
with high affinity (see, e.g., Feldmann *et al.*, International Publication No. WO 92/07076 (published
April 30, 1992); Schall *et al.*, *Cell* 61:361-370 (1990); and Loetscher *et al.*, *Cell* 61:351-359 (1990),
15 which references are entirely incorporated herein by reference) and optionally possess low
immunogenicity. In particular, the 55 kDa (p55 TNF-R) and the 75 kDa (p75 TNF-R) TNF cell surface
receptors are useful in the present invention. Truncated forms of these receptors, comprising the
extracellular domains (ECD) of the receptors or functional portions thereof (see, e.g., Corcoran *et al.*,
Eur. J. Biochem. 223:831-840 (1994)), are also useful in the present invention. Truncated forms of the
20 TNF receptors, comprising the ECD, have been detected in urine and serum as 30 kDa and 40 kDa
TNF α inhibitory binding polypeptides (Engelmann, H. *et al.*, *J. Biol. Chem.* 265:1531-1536 (1990)).
TNF receptor multimeric molecules and TNF immunoreceptor fusion molecules, and derivatives and
fragments or portions thereof, are additional examples of TNF receptor molecules which are useful in
the methods and compositions of the present invention. The TNF receptor molecules which can be
25 used in the invention are characterized by their ability to treat patients for extended periods with good
to excellent alleviation of symptoms and low toxicity. Low immunogenicity and/or high affinity, as
well as other undefined properties, can contribute to the therapeutic results achieved.

TNF receptor multimeric molecules useful in the present invention comprise all or a functional
portion of the ECD of two or more TNF receptors linked via one or more polypeptide linkers or other
30 nonpeptide linkers, such as polyethylene glycol (PEG). The multimeric molecules can further
comprise a signal peptide of a secreted polypeptide to direct expression of the multimeric molecule.
These multimeric molecules and methods for their production have been described in U.S. Application
No. 08/437,533 (filed May 9, 1995), the content of which is entirely incorporated herein by reference.

TNF immunoreceptor fusion molecules useful in the methods and compositions of the present
35 invention comprise at least one portion of one or more immunoglobulin molecules and all or a
functional portion of one or more TNF receptors. These immunoreceptor fusion molecules can be
assembled as monomers, or hetero- or homo-multimers. The immunoreceptor fusion molecules can

5 also be monovalent or multivalent. An example of such a TNF immunoreceptor fusion molecule is
TNF receptor/IgG fusion polypeptide. TNF immunoreceptor fusion molecules and methods for their
production have been described in the art (Lesslauer *et al.*, *Eur. J. Immunol.* 21:2883-2886 (1991);
Ashkenazi *et al.*, *Proc. Natl. Acad. Sci. USA* 88:10535-10539 (1991); Peppel *et al.*, *J. Exp. Med.*
174:1483-1489 (1991); Kolls *et al.*, *Proc. Natl. Acad. Sci. USA* 91:215-219 (1994); Butler *et al.*,
10 *Cytokine* 6(6):616-623 (1994); Baker *et al.*, *Eur. J. Immunol.* 24:2040-2048 (1994); Beutler *et al.*, U.S.
Patent No. 5,447,851; and U.S. Application No. 08/442,133 (filed May 16, 1995), each of which
references are entirely incorporated herein by reference). Methods for producing immunoreceptor
fusion molecules can also be found in Capon *et al.*, U.S. Patent No. 5,116,964; Capon *et al.*, U.S.
Patent No. 5,225,538; and Capon *et al.*, *Nature* 337:525-531 (1989), which references are entirely
15 incorporated herein by reference.

A functional equivalent, derivative, fragment or region of TNF receptor molecule refers to the
portion of the TNF receptor molecule, or the portion of the TNF receptor molecule sequence which
encodes TNF receptor molecule, that is of sufficient size and sequences to functionally resemble TNF
receptor molecules that can be used in the present invention (e.g., bind TNF? with high affinity and
20 possess low immunogenicity). A functional equivalent of TNF receptor molecule also includes
modified TNF receptor molecules that functionally resemble TNF receptor molecules that can be used
in the present invention (e.g., bind TNF? with high affinity and possess low immunogenicity). For
example, a functional equivalent of TNF receptor molecule can contain a "SILENT" codon or one or
more amino acid substitutions, deletions or additions (e.g., substitution of one acidic amino acid for
25 another acidic amino acid; or substitution of one codon encoding the same or different hydrophobic
amino acid for another codon encoding a hydrophobic amino acid). See Ausubel *et al.*, *Current
Protocols in Molecular Biology*, Greene Publishing Assoc. and Wiley-Interscience, New York (1987-
2000).

Cytokines include any known cytokine. See, e.g., CopewithCytokines.com. Cytokine
30 antagonists include, but are not limited to, any antibody, fragment or mimetic, any soluble receptor,
fragment or mimetic, any small molecule antagonist, or any combination thereof.

Therapeutic Treatments. Any method of the present invention can comprise a method for
treating a CNGH0004 mediated disorder or disease, comprising administering an effective amount of a
composition or pharmaceutical composition comprising at least one CNGH0004 antibody or
35 polypeptide to a cell, tissue, organ, animal or patient in need of such modulation, treatment or therapy.
Such a method can optionally further comprise co-administration or combination therapy for treating
such disorders or diseases, wherein the administering of said at least one CNGH0004 antibody or

5 polypeptide, further comprises administering, before concurrently, and/or after, at least one selected
from at least one at least one selected from at least one TNF antagonist (e.g., but not limited to a TNF
antibody or fragment, a soluble TNF receptor or fragment, fusion polypeptides thereof, or a small
molecule TNF antagonist), an antirheumatic (e.g., methotrexate, auranofin, aurothioglucose,
10 azathioprine, etanercept, gold sodium thiomalate, hydroxychloroquine sulfate, leflunomide,
sulfasalazine), a muscle relaxant, a narcotic, a non-steroid inflammatory drug (NSAID), an analgesic, an
anesthetic, a sedative, a local anesthetic, a neuromuscular blocker, an antimicrobial (e.g.,
aminoglycoside, an antifungal, an antiparasitic, an antiviral, a carbapenem, cephalosporin, a
flurorquinolone, a macrolide, a penicillin, a sulfonamide, a tetracycline, another antimicrobial), an
antipsoriatic, a corticosteroid, an anabolic steroid, a diabetes related agent, a mineral, a nutritional, a
15 thyroid agent, a vitamin, a calcium related hormone, an antidiarrheal, an antitussive, an antiemetic, an
antiulcer, a laxative, an anticoagulant, an erythropoietin (e.g., epoetin alpha), a filgrastim (e.g., G-CSF,
Neupogen), a sargramostim (GM-CSF, Leukine), an immunization, an immunoglobulin, an
immunosuppressive (e.g., basiliximab, cyclosporine, daclizumab), a growth hormone, a hormone
replacement drug, an estrogen receptor modulator, a mydriatic, a cycloplegic, an alkylating agent, an
20 antimetabolite, a mitotic inhibitor, a radiopharmaceutical, an antidepressant, antimanic agent, an
antipsychotic, an anxiolytic, a hypnotic, a sympathomimetic, a stimulant, donepezil, tacrine, an asthma
medication, a beta agonist, an inhaled steroid, a leukotriene inhibitor, a methylxanthine, a cromolyn, an
epinephrine or analog, dornase alpha (Pulmozyme), a cytokine or a cytokine antagonist.

Polypeptide Dosing

25 Typically, treatment of pathologic conditions is effected by administering an effective amount or
dosage of at least one CNGH0004 polypeptide composition that total, on average, a range from at least
about 0.001 ng to 500 milligrams of at least one CNGH0004 polypeptide per kilogram of patient per dose,
and preferably from at least about 0.1 ng to 100 milligrams antibody /kilogram of patient per single or
multiple administration, depending upon the specific activity of contained in the composition.
30 Alternatively, the effective serum concentration can comprise 0.0001ng -0.05 mg/ml serum concentration
per single or multiple administration. Suitable dosages are known to medical practitioners and will, of
course, depend upon the particular disease state, specific activity of the composition being administered,
and the particular patient undergoing treatment. In some instances, to achieve the desired therapeutic
amount, it can be necessary to provide for repeated administration, *i.e.*, repeated individual
35 administrations of a particular monitored or metered dose, where the individual administrations are
repeated until the desired daily dose or effect is achieved.

5 Preferred doses of at least one polypeptide can optionally include 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 and/or 100-500 micrograms or
10 milligrams/kg/administration, or any range, value or fraction thereof, or to achieve a serum concentration of 0.1, 0.5, 0.9, 1.0, 1.1, 1.2, 1.5, 1.9, 2.0, 2.5, 2.9, 3.0, 3.5, 3.9, 4.0, 4.5, 4.9, 5.0, 5.5, 5.9, 6.0, 6.5, 6.9, 7.0, 7.5, 7.9, 8.0, 8.5, 8.9, 9.0, 9.5, 9.9, 10, 10.5, 10.9, 11, 11.5, 11.9, 12, 12.5, 12.9, 13.0, 13.5, 13.9, 14.0, 14.5, 4.9, 5.0, 5.5, 5.9, 6.0, 6.5, 6.9, 7.0, 7.5, 7.9, 8.0, 8.5, 8.9, 9.0, 9.5, 9.9, 10, 10.5, 10.9, 11, 11.5, 11.9, 12, 12.5, 12.9, 13.0, 13.5, 13.9, 14, 14.5, 15, 15.5, 15.9, 16, 16.5, 16.9, 17, 17.5, 17.9, 18, 18.5, 18.9, 19,
15 19.5, 19.9, 20, 20.5, 20.9, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 96, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, and/or 5000 ng or $\mu\text{g/ml}$ serum concentration per single or multiple administration, or any range, value or fraction thereof.

Alternatively, the dosage administered can vary depending upon known factors, such as the
20 pharmacodynamic characteristics of the particular agent, and its mode and route of administration; age, health, and weight of the recipient; nature and extent of symptoms, kind of concurrent treatment, frequency of treatment, and the effect desired. Usually a dosage of active ingredient can be about 0.1 μg to 100 milligrams per kilogram of body weight. Ordinarily 0.0001 to 50, and preferably 0.001 to 10 milligrams per kilogram per administration or in sustained release form is effective to obtain desired
25 results.

As a non-limiting example, treatment of humans or animals can be provided as a one-time or periodic dosage of at least one antibody of the present invention 0.1 to 100 $\mu\text{g/kg}$, such as 0.5, 0.9, 1.0, 1.1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 40, 45, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 2000 or 3000 $\mu\text{g/kg}$,
30 per day, or 0.1 to 100 mg/kg, such as 0.5, 0.9, 1.0, 1.1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 40, 45, 50, 60, 70, 80, 90 or 100 mg/kg, per day, on at least one of day 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, or 40, or alternatively or additionally, at least one of week 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26,
35 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, or 52, or alternatively or additionally, at least one of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, or 20 years, or any combination thereof, using single, infusion or repeated doses.

5 Dosage forms (composition) suitable for internal administration generally contain from about
0.00001 milligram to about 500 milligrams of active ingredient per unit or container. In these
pharmaceutical compositions the active ingredient will ordinarily be present in an amount of about
0.5-99.999% by weight based on the total weight of the composition.
Typically, treatment of pathologic conditions is effected by administering an effective amount or dosage
10 of at least one CNGH0004 antibody composition that total, on average, a range from at least about
0.00001 to 500 milligrams of at least one CNGH0004 antibody per kilogram of patient per dose, and
preferably from at least about 0.0001 to 100 milligrams antibody /kilogram of patient per single or
multiple administration, depending upon the specific activity of contained in the composition.
Alternatively, the effective serum concentration can comprise 0.0001-500 µg/ml serum concentration per
15 single or multiple administration. Suitable dosages are known to medical practitioners and will, of course,
depend upon the particular disease state, specific activity of the composition being administered, and the
particular patient undergoing treatment. In some instances, to achieve the desired therapeutic amount, it
can be necessary to provide for repeated administration, *i.e.*, repeated individual administrations of a
particular monitored or metered dose, where the individual administrations are repeated until the desired
20 daily dose or effect is achieved.

Antibody Dosing

Typically, treatment of pathologic conditions is effected by administering an effective amount or
dosage of at least one CNGH0004 antibody composition that total, on average, a range from at least about
0.001 ng to 500 milligrams of at least one CNGH0004 antibody per kilogram of patient per dose, and
25 preferably from at least about 0.1 ng to 100 milligrams antibody /kilogram of patient per single or
multiple administration, depending upon the specific activity of contained in the composition.
Alternatively, the effective serum concentration can comprise 0.0001ng-0.05 mg/ml serum concentration
per single or multiple administration. Suitable dosages are known to medical practitioners and will, of
course, depend upon the particular disease state, specific activity of the composition being administered,
30 and the particular patient undergoing treatment. In some instances, to achieve the desired therapeutic
amount, it can be necessary to provide for repeated administration, *i.e.*, repeated individual
administrations of a particular monitored or metered dose, where the individual administrations are
repeated until the desired daily dose or effect is achieved.

Preferred doses of at least one antibody can optionally include 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8,
35 0.9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58,
59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87,

5 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 and/or 100-500 mg/kg/administration, or any range, value or
fraction thereof, or to achieve a serum concentration of 0.1, 0.5, 0.9, 1.0, 1.1, 1.2, 1.5, 1.9, 2.0, 2.5, 2.9,
3.0, 3.5, 3.9, 4.0, 4.5, 4.9, 5.0, 5.5, 5.9, 6.0, 6.5, 6.9, 7.0, 7.5, 7.9, 8.0, 8.5, 8.9, 9.0, 9.5, 9.9, 10, 10.5, 10.9,
11, 11.5, 11.9, 12, 12.5, 12.9, 13.0, 13.5, 13.9, 14.0, 14.5, 4.9, 5.0, 5.5, 5.9, 6.0, 6.5, 6.9, 7.0, 7.5, 7.9, 8.0,
8.5, 8.9, 9.0, 9.5, 9.9, 10, 10.5, 10.9, 11, 11.5, 11.9, 12, 12.5, 12.9, 13.0, 13.5, 13.9, 14, 14.5, 15, 15.5,
10 15.9, 16, 16.5, 16.9, 17, 17.5, 17.9, 18, 18.5, 18.9, 19, 19.5, 19.9, 20, 20.5, 20.9, 21, 22, 23, 24, 25, 26, 27,
28, 29, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 96, 100, 200, 300, 400, 500, 600, 700, 800, 900,
1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, and/or 5000 µg/ml serum concentration per single or
multiple administration, or any range, value or fraction thereof.

Alternatively, the dosage administered can vary depending upon known factors, such as the
15 pharmacodynamic characteristics of the particular agent, and its mode and route of administration; age,
health, and weight of the recipient; nature and extent of symptoms, kind of concurrent treatment,
frequency of treatment, and the effect desired. Usually a dosage of active ingredient can be about 0.1
to 100 milligrams per kilogram of body weight. Ordinarily 0.1 to 50, and preferably 0.1 to 10
milligrams per kilogram per administration or in sustained release form is effective to obtain desired
20 results.

As a non-limiting example, treatment of humans or animals can be provided as a one-time or
periodic dosage of at least one antibody of the present invention 0.1 to 100 mg/kg, such as 0.5, 0.9, 1.0,
1.1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29,
30, 40, 45, 50, 60, 70, 80, 90 or 100 mg/kg, per day, on at least one of day 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
25 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37,
38, 39, or 40, or alternatively or additionally, at least one of week 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13,
14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40,
41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, or 52, or alternatively or additionally, at least one of 1, 2, 3,
4, 5, 6,, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, or 20 years, or any combination thereof, using
30 single, infusion or repeated doses.

Dosage forms (composition) suitable for internal administration generally contain from about
0.1 milligram to about 500 milligrams of active ingredient per unit or container. In these
pharmaceutical compositions the active ingredient will ordinarily be present in an amount of about
0.5-99.999% by weight based on the total weight of the composition.

35 Administration

For parenteral administration, the antibody or polypeptide can be formulated as a solution,
suspension, emulsion or lyophilized powder in association, or separately provided, with a

5 pharmaceutically acceptable parenteral vehicle. Examples of such vehicles are water, saline, Ringer's solution, dextrose solution, and 1-10% human serum albumin. Liposomes and nonaqueous vehicles such as fixed oils can also be used. The vehicle or lyophilized powder can contain additives that maintain isotonicity (e.g., sodium chloride, mannitol) and chemical stability (e.g., buffers and preservatives). The formulation is sterilized by known or suitable techniques.

10 Suitable pharmaceutical carriers are described in the most recent edition of Remington's Pharmaceutical Sciences, A. Osol, a standard reference text in this field.

Alternative Administration

Many known and developed modes of can be used according to the present invention for administering pharmaceutically effective amounts of at least one CNGH0004 antibody according to the present invention. While pulmonary administration is used in the following description, other modes of administration can be used according to the present invention with suitable results.

CNGH0004 antibodies of the present invention can be delivered in a carrier, as a solution, emulsion, colloid, or suspension, or as a dry powder, using any of a variety of devices and methods suitable for administration by inhalation or other modes described here within or known in the art.

Parenteral Formulations and Administration

Formulations for parenteral administration can contain as common excipients sterile water or saline, polyalkylene glycols such as polyethylene glycol, oils of vegetable origin, hydrogenated naphthalenes and the like. Aqueous or oily suspensions for injection can be prepared by using an appropriate emulsifier or humidifier and a suspending agent, according to known methods. Agents for injection can be a non-toxic, non-orally administrable diluting agent such as aqueous solution or a sterile injectable solution or suspension in a solvent. As the usable vehicle or solvent, water, Ringer's solution, isotonic saline, etc. are allowed; as an ordinary solvent, or suspending solvent, sterile involatile oil can be used. For these purposes, any kind of involatile oil and fatty acid can be used, including natural or synthetic or semisynthetic fatty oils or fatty acids; natural or synthetic or semisynthetic mono- or di- or tri-glycerides. Parental administration is known in the art and includes, but is not limited to, conventional means of injections, a gas pressured needle-less injection device as described in U.S. Pat. No. 5,851,198, and a laser perforator device as described in U.S. Pat. No. 5,839,446 entirely incorporated herein by reference.

Alternative Delivery

35 The invention further relates to the administration of at least one CNGH0004 antibody by parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracebellar, intracerebroventricular, intracolic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic,

5 intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal, intrarenal,
intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus,
vaginal, rectal, buccal, sublingual, intranasal, or transdermal means. At least one CNGH0004 antibody
composition can be prepared for use for parenteral (subcutaneous, intramuscular or intravenous) or any
10 other administration particularly in the form of liquid solutions or suspensions; for use in vaginal or
rectal administration particularly in semisolid forms such as, but not limited to, creams and
suppositories; for buccal, or sublingual administration such as, but not limited to, in the form of tablets
or capsules; or intranasally such as, but not limited to, the form of powders, nasal drops or aerosols or
certain agents; or transdermally such as not limited to a gel, ointment, lotion, suspension or patch
15 delivery system with chemical enhancers such as dimethyl sulfoxide to either modify the skin structure
or to increase the drug concentration in the transdermal patch (Junginger, et al. In "Drug Permeation
Enhancement"; Hsieh, D. S., Eds., pp. 59-90 (Marcel Dekker, Inc. New York 1994, entirely
incorporated herein by reference), or with oxidizing agents that enable the application of formulations
containing polypeptides and peptides onto the skin (WO 98/53847), or applications of electric fields to
20 create transient transport pathways such as electroporation, or to increase the mobility of charged drugs
through the skin such as iontophoresis, or application of ultrasound such as sonophoresis (U.S. Pat.
Nos. 4,309,989 and 4,767,402) (the above publications and patents being entirely incorporated herein
by reference).

Pulmonary/Nasal Administration

For pulmonary administration, preferably at least one CNGH0004 antibody composition is
25 delivered in a particle size effective for reaching the lower airways of the lung or sinuses. According
to the invention, at least one CNGH0004 antibody can be delivered by any of a variety of inhalation or
nasal devices known in the art for administration of a therapeutic agent by inhalation. These devices
capable of depositing aerosolized formulations in the sinus cavity or alveoli of a patient include
metered dose inhalers, nebulizers, dry powder generators, sprayers, and the like. Other devices suitable
30 for directing the pulmonary or nasal administration of antibodies are also known in the art. All such
devices can use of formulations suitable for the administration for the dispensing of antibody in an
aerosol. Such aerosols can be comprised of either solutions (both aqueous and non aqueous) or solid
particles. Metered dose inhalers like the Ventolin[®] metered dose inhaler, typically use a propellant gas
and require actuation during inspiration (See, e.g., WO 94/16970, WO 98/35888). Dry powder
35 inhalers like Turbuhaler[™] (Astra), Rotahaler[®] (Glaxo), Diskus[®] (Glaxo), Spiros[™] inhaler (Dura),
devices marketed by Inhale Therapeutics, and the Spinhaler[®] powder inhaler (Fisons), use breath-
actuation of a mixed powder (US 4668218 Astra, EP 237507 Astra, WO 97/25086 Glaxo, WO

5 94/08552 Dura, US 5458135 Inhale, WO 94/06498 Fisons, entirely incorporated herein by reference).
Nebulizers like AERx™ Aradigm, the Ultravent® nebulizer (Mallinckrodt), and the Acorn II® nebulizer
10 (Marquest Medical Products) (US 5404871 Aradigm, WO 97/22376), the above references entirely
incorporated herein by reference, produce aerosols from solutions, while metered dose inhalers, dry
powder inhalers, etc. generate small particle aerosols. These specific examples of commercially
available inhalation devices are intended to be a representative of specific devices suitable for the
practice of this invention, and are not intended as limiting the scope of the invention. Preferably, a
composition comprising at least one CNGH0004 antibody is delivered by a dry powder inhaler or a
sprayer. There are several desirable features of an inhalation device for administering at least one
antibody of the present invention. For example, delivery by the inhalation device is advantageously
15 reliable, reproducible, and accurate. The inhalation device can optionally deliver small dry particles,
e.g. less than about 10 µm, preferably about 1-5 µm, for good respirability.

Administration of CNGH0004 antibody Compositions as a Spray

A spray including CNGH0004 antibody composition can be produced by forcing a suspension
or solution of at least one CNGH0004 antibody through a nozzle under pressure. The nozzle size and
20 configuration, the applied pressure, and the liquid feed rate can be chosen to achieve the desired output
and particle size. An electrospray can be produced, for example, by an electric field in connection with
a capillary or nozzle feed. Advantageously, particles of at least one CNGH0004 antibody composition
delivered by a sprayer have a particle size less than about 10 µm, preferably in the range of about 1 µm
to about 5 µm, and most preferably about 2 µm to about 3 µm.

25 Formulations of at least one CNGH0004 polypeptide or antibody composition suitable for use
with a sprayer typically include antibody or polypeptide compositions in an aqueous solution at a
concentration of about 0.000001 mg to about 1000 mg of at least one CNGH0004 antibody or
polypeptide composition per ml of solution or mg/gm, or any range or value therein, e.g., but not limited
to, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
30 23, 24, 25, 26, 27, 28, 29, 30, 40, 45, 50, 60, 70, 80, 90 or 100 ng or µg or mg/ml or ng or µg or mg/gm.
The formulation can include agents such as an excipient, a buffer, an isotonicity agent, a preservative,
a surfactant, and, preferably, zinc. The formulation can also include an excipient or agent for
stabilization of the antibody composition, such as a buffer, a reducing agent, a bulk polypeptide, or a
carbohydrate. Bulk polypeptides useful in formulating antibody compositions include albumin,
35 protamine, or the like. Typical carbohydrates useful in formulating antibody compositions include
sucrose, mannitol, lactose, trehalose, glucose, or the like. The antibody composition formulation can
also include a surfactant, which can reduce or prevent surface-induced aggregation of the antibody or

5 polypeptide composition caused by atomization of the solution in forming an aerosol. Various conventional surfactants can be employed, such as polyoxyethylene fatty acid esters and alcohols, and polyoxyethylene sorbitol fatty acid esters. Amounts will generally range between 0.001 and 14% by weight of the formulation. Especially preferred surfactants for purposes of this invention are polyoxyethylene sorbitan monooleate, polysorbate 80, polysorbate 20, or the like. Additional agents
10 known in the art for formulation of a polypeptide such as CNGH0004 antibodies, or specified portions or variants, can also be included in the formulation.

Administration of CNGH0004 antibody compositions by a Nebulizer

Antibody composition can be administered by a nebulizer, such as jet nebulizer or an ultrasonic nebulizer. Typically, in a jet nebulizer, a compressed air source is used to create a high-
15 velocity air jet through an orifice. As the gas expands beyond the nozzle, a low-pressure region is created, which draws a solution of antibody composition through a capillary tube connected to a liquid reservoir. The liquid stream from the capillary tube is sheared into unstable filaments and droplets as it exits the tube, creating the aerosol. A range of configurations, flow rates, and baffle types can be employed to achieve the desired performance characteristics from a given jet nebulizer. In an
20 ultrasonic nebulizer, high-frequency electrical energy is used to create vibrational, mechanical energy, typically employing a piezoelectric transducer. This energy is transmitted to the formulation of antibody composition either directly or through a coupling fluid, creating an aerosol including the antibody composition. Advantageously, particles of antibody composition delivered by a nebulizer have a particle size less than about 10 μm , preferably in the range of about 1 μm to about 5 μm , and
25 most preferably about 2 μm to about 3 μm .

Formulations of at least one CNGH0004 antibody suitable for use with a nebulizer, either jet or ultrasonic, typically include a concentration of about 0.1 mg to about 100 mg of at least one CNGH0004 antibody polypeptide per ml of solution. The formulation can include agents such as an excipient, a buffer, an isotonicity agent, a preservative, a surfactant, and, preferably, zinc. The
30 formulation can also include an excipient or agent for stabilization of the at least one CNGH0004 antibody composition, such as a buffer, a reducing agent, a bulk polypeptide, or a carbohydrate. Bulk polypeptides useful in formulating at least one CNGH0004 antibody compositions include albumin, protamine, or the like. Typical carbohydrates useful in formulating at least one CNGH0004 antibody include sucrose, mannitol, lactose, trehalose, glucose, or the like. The at least one CNGH0004
35 antibody formulation can also include a surfactant, which can reduce or prevent surface-induced aggregation of the at least one CNGH0004 antibody caused by atomization of the solution in forming an aerosol. Various conventional surfactants can be employed, such as polyoxyethylene fatty acid

5 esters and alcohols, and polyoxyethylene sorbital fatty acid esters. Amounts will generally range between 0.001 and 4% by weight of the formulation. Especially preferred surfactants for purposes of this invention are polyoxyethylene sorbitan mono-oleate, polysorbate 80, polysorbate 20, or the like. Additional agents known in the art for formulation of a polypeptide such as antibody polypeptide can also be included in the formulation.

10 **Administration of CNGH0004 antibody compositions By A Metered Dose Inhaler**

In a metered dose inhaler (MDI), a propellant, at least one CNGH0004 antibody, and any excipients or other additives are contained in a canister as a mixture including a liquefied compressed gas. Actuation of the metering valve releases the mixture as an aerosol, preferably containing particles in the size range of less than about 10 μm , preferably about 1 μm to about 5 μm , and most preferably about 2 μm to about 3 μm . The desired aerosol particle size can be obtained by employing a formulation of antibody composition produced by various methods known to those of skill in the art, including jet-milling, spray drying, critical point condensation, or the like. Preferred metered dose inhalers include those manufactured by 3M or Glaxo and employing a hydrofluorocarbon propellant.

Formulations of at least one CNGH0004 antibody for use with a metered-dose inhaler device will generally include a finely divided powder containing at least one CNGH0004 antibody as a suspension in a non-aqueous medium, for example, suspended in a propellant with the aid of a surfactant. The propellant can be any conventional material employed for this purpose, such as chlorofluorocarbon, a hydrochlorofluorocarbon, a hydrofluorocarbon, or a hydrocarbon, including trichlorofluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethanol and 1,1,1,2-tetrafluoroethane, HFA-134a (hydrofluoroalkane-134a), HFA-227 (hydrofluoroalkane-227), or the like. Preferably the propellant is a hydrofluorocarbon. The surfactant can be chosen to stabilize the at least one CNGH0004 antibody as a suspension in the propellant, to protect the active agent against chemical degradation, and the like. Suitable surfactants include sorbitan trioleate, soya lecithin, oleic acid, or the like. In some cases solution aerosols are preferred using solvents such as ethanol. Additional agents known in the art for formulation of a polypeptide such as polypeptide can also be included in the formulation.

One of ordinary skill in the art will recognize that the methods of the current invention can be achieved by pulmonary administration of at least one CNGH0004 antibody compositions via devices not described herein.

35 **Oral Formulations and Administration**

Formulations for oral rely on the co-administration of adjuvants (e.g., resorcinols and nonionic surfactants such as polyoxyethylene oleyl ether and n-hexadecylpolyethylene ether) to increase

5 artificially the permeability of the intestinal walls, as well as the co-administration of enzymatic inhibitors (e.g., pancreatic trypsin inhibitors, diisopropylfluorophosphate (DFF) and trasylol) to inhibit enzymatic degradation. The active constituent compound of the solid-type dosage form for oral administration can be mixed with at least one additive, including sucrose, lactose, cellulose, mannitol, trehalose, raffinose, maltitol, dextran, starches, agar, arginates, chitins, chitosans, pectins, gum
10 tragacanth, gum arabic, gelatin, collagen, casein, albumin, synthetic or semisynthetic polymer, and glyceride. These dosage forms can also contain other type(s) of additives, e.g., inactive diluting agent, lubricant such as magnesium stearate, paraben, preserving agent such as sorbic acid, ascorbic acid, .alpha.-tocopherol, antioxidant such as cysteine, disintegrator, binder, thickener, buffering agent, sweetening agent, flavoring agent, perfuming agent, etc.

15 Tablets and pills can be further processed into enteric-coated preparations. The liquid preparations for oral administration include emulsion, syrup, elixir, suspension and solution preparations allowable for medical use. These preparations can contain inactive diluting agents ordinarily used in said field, e.g., water. Liposomes have also been described as drug delivery systems for insulin and heparin (U.S. Pat. No. 4,239,754). More recently, microspheres of artificial polymers
20 of mixed amino acids (polypeptideoids) have been used to deliver pharmaceuticals (U.S. Pat. No. 4,925,673). Furthermore, carrier compounds described in U.S. Pat. No. 5,879,681 and U.S. Pat. No. 5,5,871,753 are used to deliver biologically active agents orally are known in the art.

Mucosal Formulations and Administration

For absorption through mucosal surfaces, compositions and methods of administering at least
25 one CNGH0004 antibody include an emulsion comprising a plurality of submicron particles, a mucoadhesive macromolecule, a bioactive peptide, and an aqueous continuous phase, which promotes absorption through mucosal surfaces by achieving mucoadhesion of the emulsion particles (U.S. Pat. Nos. 5,514,670). Mucous surfaces suitable for application of the emulsions of the present invention can include corneal, conjunctival, buccal, sublingual, nasal, vaginal, pulmonary, stomachic, intestinal,
30 and rectal routes of administration. Formulations for vaginal or rectal administration, e.g. suppositories, can contain as excipients, for example, polyalkyleneglycols, vaseline, cocoa butter, and the like. Formulations for intranasal administration can be solid and contain as excipients, for example, lactose or can be aqueous or oily solutions of nasal drops. For buccal administration excipients include sugars, calcium stearate, magnesium stearate, pregelatinated starch, and the like (U.S. Pat. Nos.
35 5,849,695).

Transdermal Formulations and Administration

For transdermal administration, the at least one CNGH0004 antibody is encapsulated in a

5 delivery device such as a liposome or polymeric nanoparticles, microparticle, microcapsule, or
microspheres (referred to collectively as microparticles unless otherwise stated). A number of suitable
devices are known, including microparticles made of synthetic polymers such as polyhydroxy acids
such as polylactic acid, polyglycolic acid and copolymers thereof, polyorthoesters, polyanhydrides, and
polyphosphazenes, and natural polymers such as collagen, polyamino acids, albumin and other
10 polypeptides, alginate and other polysaccharides, and combinations thereof (U.S. Pat. Nos. 5,814,599).

Prolonged Administration and Formulations

It can be sometimes desirable to deliver the compounds of the present invention to the subject
over prolonged periods of time, for example, for periods of one week to one year from a single
administration. Various slow release, depot or implant dosage forms can be utilized. For example, a
15 dosage form can contain a pharmaceutically acceptable non-toxic salt of the compounds that has a low
degree of solubility in body fluids, for example, (a) an acid addition salt with a polybasic acid such as
phosphoric acid, sulfuric acid, citric acid, tartaric acid, tannic acid, pamoic acid, alginic acid,
polyglutamic acid, naphthalene mono- or di-sulfonic acids, polygalacturonic acid, and the like; (b) a
salt with a polyvalent metal cation such as zinc, calcium, bismuth, barium, magnesium, aluminum,
20 copper, cobalt, nickel, cadmium and the like, or with an organic cation formed from e.g., N,N'-
dibenzyl-ethylenediamine or ethylenediamine; or (c) combinations of (a) and (b) e.g. a zinc tannate
salt. Additionally, the compounds of the present invention or, preferably, a relatively insoluble salt
such as those just described, can be formulated in a gel, for example, an aluminum monostearate gel
with, e.g. sesame oil, suitable for injection. Particularly preferred salts are zinc salts, zinc tannate salts,
25 pamoate salts, and the like. Another type of slow release depot formulation for injection would contain
the compound or salt dispersed for encapsulated in a slow degrading, non-toxic, non-antigenic polymer
such as a polylactic acid/polyglycolic acid polymer for example as described in U.S. Pat. No.
3,773,919. The compounds or, preferably, relatively insoluble salts such as those described above can
also be formulated in cholesterol matrix silastic pellets, particularly for use in animals. Additional slow
30 release, depot or implant formulations, e.g. gas or liquid liposomes are known in the literature (U.S.
Pat. Nos. 5,770,222 and "Sustained and Controlled Release Drug Delivery Systems", J. R. Robinson
ed., Marcel Dekker, Inc., N.Y., 1978).

Having generally described the invention, the same will be more readily understood by
35 reference to the following examples, which are provided by way of illustration and are not intended as
limiting.

5 **Example 1: Cloning and Expression of CNGH0004 polypeptide or antibody in Mammalian Cells**

A typical mammalian expression vector contains at least one promoter element, which mediates the initiation of transcription of mRNA, the polypeptide or antibody coding sequence, and signals required for the termination of transcription and polyadenylation of the transcript. Additional
10 elements include enhancers, Kozak sequences and intervening sequences flanked by donor and acceptor sites for RNA splicing. Highly efficient transcription can be achieved with the early and late promoters from SV40, the long terminal repeats (LTRS) from Retroviruses, e.g., RSV, HTLV1, HIV1 and the early promoter of the cytomegalovirus (CMV). However, cellular elements can also be used (e.g., the human actin promoter). Suitable expression vectors for use in practicing the present
15 invention include, for example, vectors such as pIRES1neo, pRetro-Off, pRetro-On, PLXSN, or pLNCX (Clonetech Labs, Palo Alto, CA), pcDNA3.1 (+/-), pcDNA/Zeo (+/-) or pcDNA3.1/Hygro (+/-) (Invitrogen), PSVL and PMSG (Pharmacia, Uppsala, Sweden), pRSVcat (ATCC 37152), pSV2dhfr (ATCC 37146) and pBC12MI (ATCC 67109). Mammalian host cells that could be used include human HeLa 293, H9 and Jurkat cells, mouse NIH3T3 and C127 cells, Cos 1, Cos 7 and CV 1, quail
20 QC1-3 cells, mouse L cells and Chinese hamster ovary (CHO) cells.

Alternatively, the gene can be expressed in stable cell lines that contain the gene integrated into a chromosome. The co-transfection with a selectable marker such as dhfr, gpt, neomycin, or hygromycin allows the identification and isolation of the transfected cells.

The transfected gene can also be amplified to express large amounts of the encoded
25 polypeptide or antibody, e.g., as a desired portion of at least one of SEQ ID NO:1. The DHFR (dihydrofolate reductase) marker is useful to develop cell lines that carry several hundred or even several thousand copies of the gene of interest. Another useful selection marker is the enzyme glutamine synthase (GS) (Murphy, et al., *Biochem. J.* 227:277-279 (1991); Bebbington, et al., *Bio/Technology* 10:169-175 (1992)). Using these markers, the mammalian cells are grown in selective
30 medium and the cells with the highest resistance are selected. These cell lines contain the amplified gene(s) integrated into a chromosome. Chinese hamster ovary (CHO) and NSO cells are used for the production of antibodies or polypeptides of the present invention.

The expression vectors pC1 and pC4 contain the strong promoter (LTR) of the Rous Sarcoma Virus (Cullen, et al., *Molec. Cell. Biol.* 5:438-447 (1985)) plus a fragment of the CMV-enhancer
35 (Boshart, et al., *Cell* 41:521-530 (1985)). Multiple cloning sites, e.g., with the restriction enzyme cleavage sites BamHI, XbaI and Asp718, facilitate the cloning of the gene of interest. The vectors contain in addition the 3' intron, the polyadenylation and termination signal of the rat preproinsulin gene.

5 Cloning and Expression in CHO Cells

The vector pC4 is used for the expression of CNGH0004 antibody or polypeptide, e.g., using a coding sequence for at least one of SEQ ID NO:1, such as but not limited to SEQ ID NO:2. Plasmid pC4 is a derivative of the plasmid pSV2-dhfr (ATCC Accession No. 37146). The plasmid contains the mouse DHFR gene under control of the SV40 early promoter. Chinese hamster ovary- or other cells lacking dihydrofolate activity that are transfected with these plasmids can be selected by growing the cells in a selective medium (e.g., alpha minus MEM, Life Technologies, Gaithersburg, MD) supplemented with the chemotherapeutic agent methotrexate. The amplification of the DHFR genes in cells resistant to methotrexate (MTX) has been well documented (see, e.g., F. W. Alt, et al., *J. Biol. Chem.* 253:1357-1370 (1978); J. L. Hamlin and C. Ma, *Biochem. et Biophys. Acta* 1097:107-143 (1990); and M. J. Page and M. A. Sydenham, *Biotechnology* 9:64-68 (1991)). Cells grown in increasing concentrations of MTX develop resistance to the drug by overproducing the target enzyme, DHFR, as a result of amplification of the DHFR gene. If a second gene is linked to the DHFR gene, it is usually co-amplified and over-expressed. It is known in the art that this approach can be used to develop cell lines carrying more than 1,000 copies of the amplified gene(s). Subsequently, when the methotrexate is withdrawn, cell lines are obtained that contain the amplified gene integrated into one or more chromosome(s) of the host cell.

Plasmid pC4 contains coding DNA for expressing the gene of interest under control of the strong promoter of the long terminal repeat (LTR) of the Rous Sarcoma Virus (Cullen, et al., *Molec. Cell. Biol.* 5:438-447 (1985)) plus a fragment isolated from the enhancer of the immediate early gene of human cytomegalovirus (CMV) (Boshart, et al., *Cell* 41:521-530 (1985)). Downstream of the promoter are BamHI, XbaI, and Asp718 restriction enzyme cleavage sites that allow integration of the genes. Behind these cloning sites the plasmid contains the 3' intron and polyadenylation site of the rat preproinsulin gene. Other high efficiency promoters can also be used for the expression, e.g., the human b-actin promoter, the SV40 early or late promoters or the long terminal repeats from other retroviruses, e.g., HIV and HTLV. Clontech's Tet-Off and Tet-On gene expression systems and similar systems can be used to express the CNGH0004 polypeptide in a regulated way in mammalian cells (M. Gossen, and H. Bujard, *Proc. Natl. Acad. Sci. USA* 89: 5547-5551 (1992)). For the polyadenylation of the mRNA other signals, e.g., from the human growth hormone or globin genes can be used as well. Stable cell lines carrying a gene of interest integrated into the chromosomes can also be selected upon co-transfection with a selectable marker such as gpt, G418 or hygromycin. It can be advantageous to use more than one selectable marker in the beginning, e.g., G418 plus methotrexate.

The plasmid pC4 is digested with restriction enzymes and then dephosphorylated using calf

5 intestinal phosphatase by procedures known in the art. The vector is then isolated from a 1% agarose gel.

The DNA sequence encoding the desired CNGH0004 antibody or polypeptide is used, e.g., DNA or RNA coding for at least one of SEQ ID NO:1, such as but not limited to SEQ ID NO:2 corresponding to at least one portion of at least one CNGH0004 antibody polypeptide of the present
10 invention, according to known method steps.

The isolated encoding DNA and the dephosphorylated vector are then ligated with T4 DNA ligase. *E. coli* HB101 or XL-1 Blue cells are then transformed and bacteria are identified that contain the fragment inserted into plasmid pC4 using, for instance, restriction enzyme analysis.

Chinese hamster ovary (CHO) cells lacking an active DHFR gene are used for transfection. 5
15 μg of the expression plasmid pC4 is cotransfected with 0.5 μg of the plasmid pSV2-neo using lipofectin. The plasmid pSV2neo contains a dominant selectable marker, the neo gene from Tn5 encoding an enzyme that confers resistance to a group of antibiotics including G418. The cells are seeded in alpha minus MEM supplemented with 1 $\mu\text{g}/\text{ml}$ G418. After 2 days, the cells are trypsinized and seeded in hybridoma cloning plates (Greiner, Germany) in alpha minus MEM supplemented with
20 10, 25, or 50 ng/ml of methotrexate plus 1 $\mu\text{g}/\text{ml}$ G418. After about 10-14 days single clones are trypsinized and then seeded in 6-well petri dishes or 10 ml flasks using different concentrations of methotrexate (50 nM, 100 nM, 200 nM, 400 nM, 800 nM). Clones growing at the highest concentrations of methotrexate are then transferred to new 6-well plates containing even higher concentrations of methotrexate (1 mM, 2 mM, 5 mM, 10 mM, 20 mM). The same procedure is
25 repeated until clones are obtained that grow at a concentration of 100 - 200 mM. Expression of the desired gene product is analyzed, for instance, by SDS-PAGE and Western blot or by reverse phase HPLC analysis.

**Example 2: Discovery of CNGH0004 nucleic acid and amino acid sequences and fragments and
30 domains thereof**

Skin biopsy samples were collected from patients with moderate to severe psoriasis. Seven samples were obtained at baseline (week 0) from lesional sites. Five were obtained from lesional site at 2 weeks post-infliximab treatment. Total RNA were extracted from each biopsy sample and were hybridized to two different types of cDNA arrays. RNA preparation, labeling, and hybridization were
35 performed as reported previously (9). Raw intensity data from the cDNA arrays were first normalized within each sample. Linear normalization and then nonlinear normalization was performed within each sample. Outlier intensity data points (greater than 1.4 fold away from the median of replicate

5 measurements) were identified and removed from the data sets. The average intensity was generated by calculating the arithmetic mean of nonoutlier intensity values. Spline normalization of the average intensity was then performed across all samples in the data sets. Sample comparison was made between week 0 and week 2.

10 Data mining was performed using OmniViz software (Maynard, MA). Data comparisons were expressed as ratios in OmniViz and the \log_2 of ratios were used to cluster expression data. Clustering was performed first using the Kmeans method. All genes were filtered by a single fold change greater than or equal to 2 for either increase or decrease in expression. Genes that past the filters were then clustered using a hierarchical method and correlation metric.

Description of CNGH0004 gene

15 CNGH0004 is located on Chromosome 9q31.3, from nucleotide 1065860007 to 106800277 on the minus strand based on the human reference sequence (UCSC version hg15, which is based on NCBI Build 33 and was produced by the International Human Genome Sequencing Consortium). The human genome sequence covers about 99 percent of the gene-containing regions in the genome, and has been sequenced to an accuracy of 99.99 percent. CNGH0004 neighbors MUSK gene at 5' end and
20 TXN gene at 3' end. The gene is 214270 base pairs long, spreading over three BACS, AL592463, AL354982, and AL158158 from 5' to 3'.

Known mRNAs mapped to this region include Homo sapiens likely ortholog of mouse polydom (NM_024500), Homo sapiens cDNA FLJ14964 fis(AK027870), Homo sapiens mRNA full length insert cDNA clone EUROIMAGE 248114 (AL079279), Homo sapiens serologically defined
25 breast cancer antigen NY-BR-38 mRNA (AF308289), and Homo sapiens cDNA FLJ13529 fis (AK023591).

CNGH0004 transcript is 11,996 bp long. The transcript includes 5' UTR of 1000 bp, 48 exons, and 3' UTR of 280 bp. The ployA signal sequence is not identified.

30 Polymorphism analysis against public SNP database (<http://www.ncbi.nlm.nih.gov/SNP/>) as well as NM_024500 revealed 12 SNPs within CNGH0004 coding region (CDS). Eight of the 12 changes result in non-synonymous changes at amino acid level (Table 1).

Conceptual translation of CNGH0004 results in a polypeptide of 3571 amino acid residues. It shares 81.7% residues with mouse Polydom (10) across the entire length and seems to be an ortholog of the mouse protein.

35 Both proteins share significant overall domain structures: an N-terminal signal peptide followed by a Von Willebrand factor (VWA) domain, 3 CCP (Sushi) domains, 2 Hyalin domains, 1 more CCP domain, 6 EGF-like domains, a Pentaxin domain, 2 more CCP domains, one EGF-like

5 domain, 28 more CCP domains, and 3 more EGF-like domains at the very C-terminus. There is another unclassified cystein-rich domain (pfam-B 232) that repeated 4 times at the N-terminal portion of the protein (Table 2).

Sequence analysis shows that CNGH0004 and mouse Polydom represent a new sub-family within the EGF superfamily of protein. The members of this sub-family include Q9VM55 of
10 *Drosophila melanogaster*, and Q20535 of *C. elegans*. The common signature of this family is a combination of CCP, EGF-like and Hyalin domain, often repeated many times. Based on the distribution pattern of these domains in other proteins, CNGH0004 protein can be classified as a secreted extracellular matrix protein probably involves in tissue remodeling.

VWA domains in extracellular eukaryotic proteins mediate adhesion via metal ion-dependent
15 adhesion sites (MIDAS). It has been implicated in the immune and haemostatic systems, cell adhesion or matrix assembly (11).

CCP domain, also known as Sushi repeat or short complement-like repeat (SCR), is approximately 60 amino acid residues long and has been identified in most components and regulatory proteins of the complement cascade. Prototype members of this protein family are molecules that
20 regulate the complement system (12, 13). CCP repeats have also been identified in the selectin family of adhesion molecules. CCP modules contain proteins of the complement system (14).

Hyalin Repeat, also known as HYR domain, is named after the protein hyalin that is composed exclusively of this repeat. This domain probably corresponds to a new superfamily in the immunoglobulin fold. This domain may be involved in cell adhesion (15).

25 EGF-like (including EGF_CA) domain is found in the sequence of epidermal growth factor (EGF) and in a large number of membrane-bound and extracellular proteins with various biological functions such as blood coagulation, control of cell fate, cell adhesion, activation of complement and fibrinolysis (16, 17). Many of these proteins require calcium for their biological function. A calcium-binding site has been found to be located at the N-terminus of the EGF-like domains. Calcium-binding
30 may be crucial for numerous protein-protein interactions.

Pentaxins (or pentraxins) are a family of proteins that show, under electron microscope, a discoid arrangement of five noncovalently bound subunits. Proteins of the pentaxin family are involved in acute immunological responses. PTX domain mediates binding of a variety of ligands which is Calcium-dependent (18).

35

Example 3: Expression of CNGH0004 in normal and diseased human tissues

We queried microarray expression database at Johnson & Johnson Pharmaceutical R&D at La

5 Jolla, as well as public expression database such as SAGE (<http://www.ncbi.nlm.nih.gov/SAGE/>).
CNGH0004 gene is expressed at a high level in normal placenta and fetal tissues. It's at a lower, but
detectable level in adult tissues including breast, ear, heart, pancreas, nose, and brain tissues.

We validated the above findings with real-time quantitative PCR using ABI Prism 7900
Sequence Detection System (Applied Biosystems, Foster City, CA). Human tissue master plate was
10 prepared according to Pinhasov et al (19). Total RNA from 83 representative human tissues was
purchased from Strategene (La Jolla, CA).

Two primer-probe sets were ordered from Applied Biosystem as their Assays-on-
Demand™ Gene Expression Products (Foster City, CA): Hs00225829_m1, which covers sequence
GGTGTGTGGAGCGCCACTGTTCCAC that correspond to 2475 -2499 of CNGH0004; and
15 Hs00295944_m1, which covers sequence ATGCAAAGAGACCAGGTGTGAACT that correspond to
10879 -10903 of CNGH0004. As shown in Table 3, both primer-probes sets yield similar results that
are in agreement with *in silico* findings.

Expression of CNGH0004 in most human tissues is very low (table 3). Moderate expression
can be detected in adrenal, colon, lung, ovary, pericardium, skin, spleen, stomach, testis, and thymus.
20 The highest expression by far is in placenta, which is at least over 20-fold increase compared to those
tissues with moderate expression. CNGH0004 is virtually undetectable in the 10 cell lines we tested.

In certain cancer tissues, however, CNGH0004 expression is significantly elevated. These
include glioblastoma, melanoma, colon epithelia, prostate carcinoma, ovary serous adenocarcinoma,
pancreas neoplasia, and stomach adeno-carcinoma.

25 CNGH0004 is also detected at above normal levels in asthmatic airway smooth muscle cells.

Expression level of CNGH0004 is lower in psoriatic lesional areas as compared to non-
lesional areas. REMICADE treatment restores its level back to normal.

Example 4: CNGH0004 involvement in cell migration and invasion of metastasis tumors

30 The establishment of metastasis requires that tumor cells acquire new adhesion and migration
properties to emigrate from primary sites and colonize distant organs. CNGH0004 is a cell membrane
protein often overexpressed on tumor cells and, being both a cell-cell and cell-extracellular matrix
adhesion protein, is well positioned to contribute to this process. Indeed, a fragment of CNGH0004
was identified as serologically defined breast cancer antigen NY-BR-38 mRNA. Furthermore, the
35 interaction of CNGH0004 with other cellular proteins involved in motogenesis and proteolysis is a
determinant factor in cell migration and invasion.

The role of CNGH0004 in angiogenesis can also be investigated using *in vitro* cell migration

5 and invasion assays. Human microvascular endothelial cells (HMVEC) transfected with CNGH0004
gene, or its antisense, or siRNA constructs, are seeded in the top wells of the transwell system, in cell
medium containing 1% FBS. In the bottom wells, culturing medium with 10% FBS serve as a
chemotactic source to induce cell migration or invasion. The top and bottom wells are separated by a
10 membrane with pores of 8 μm in diameter. The membrane is either uncoated or coated with various
extracellular matrix proteins, i.e., collagen, fibronectin, vitronectin, or Matrigel, for determining cell
migration or invasion. It is expected that modulation of CNGH0004 changes the properties of
endothelial cell migration and invasion stimulation. The specificity of CNGH0004 in endothelial cell
migration and invasion are investigated using CNGH0004 antibody of the present invention. Such
antibodies block at least one biological activity of CNGH0004.

15

Advantage/Utilities

CNGH0004 gene is a human ortholog of the mouse Polydom gene. After conceptual
translation, the two proteins share extensive homology (81.7%) that is also reflected on their protein
domain patterns. The extremely high evolutionary conservation implied that the function of CNGH0004
20 and Polydom is essential to human and mouse, respectively. It is also evident from its ubiquitous
expression pattern in embryonic tissues in human and mouse.

Based on N-terminal signal peptide, CNGH0004 protein is predicted to be an extracellular
matrix protein. All CNGH0004 protein domains are characterized as extracellular domains.

25 With 10 EGF domains, which tend to be glycosylated, CNGH0004 is likely to be post-
translationally modified (PTM), such as glycosylation. With its high molecular weight and the
possible PTM, CNGH0004 is likely distributed in the vicinity of cells that express it. As a target, it is
amendable for localized treatment such as subcutaneous injection. Since it is accessible for antagonists
and agonists thereto including monoclonal antibodies, vaccines, and adjuvants. CNGH0004 can well be
suited for an antibody target.

30 In addition to normal placenta and fetal tissue development, protein domains that constitute
CNGH0004 are probably also involved in tissue remodeling of airway smooth muscle as well as
psoriatic epithelium. Based on its domain structure, CNGH0004 may function through mediating
adhesion via metal ion-dependent adhesion sites (MIDAS), or via modulating complement control
related to immunological responses. As such, CNGH0004 is a potential therapeutic target for treatment
35 of autoimmune or chronic inflammatory diseases including, but not limited to psoriasis, asthma, and
different types of cancers.

5 Table 1. Non-synonymous SNPs within CNGH0004

| Nucleotide position | Nucleotide change | Amino acid position | Amino acid change |
|---------------------|-------------------|---------------------|-------------------|
| 2286 | C->T | 429 | Ser->Leu |
| 2519 | G->A | 507 | Val->Ile |
| 3526 | C->G | 842 | Cys->Trp |
| 3939 | A->G | 980 | Glu->Gly |
| 4188 | A->G | 1063 | Tyr->Cys |
| 5246 | A->C | 1416 | Lys->Gln |
| 5325 | A->T | 1442 | Asp->Val |
| 6429 | C->A | A1810E | Ala->Glu |

10 Table 2. Protein domains and locations on CNGH0004.

| Domain Name | Pfam ID | Start residue | End residue |
|----------------|---------|---------------|-------------|
| Signal Peptide | | 1 | 41 |
| VWA | | 83 | 259 |
| Pfam-B_232 | | 305 | 360 |
| Sushi/CCP | PF00084 | 378 | 433 |
| Sushi/CCP | PF00084 | 438 | 493 |
| Sushi/CCP | PF00084 | 498 | 559 |
| HYR | PF02494 | 561 | 642 |
| HYR | PF02494 | 643 | 722 |
| CCP | PF00084 | 727 | 787 |
| Pfam-B_232 | | 999 | 1036 |
| Pfam-B_232 | | 1041 | 1106 |
| Pfam-B_232 | | 1108 | 1160 |
| EGF-like | PF00008 | 1196 | 1229 |
| EGF-like | PF00008 | 1231 | 1267 |
| EGF-like | PF00008 | 1269 | 1305 |
| EGF-like | PF00008 | 1307 | 1343 |
| EGF-like | PF00008 | 1345 | 1381 |

| | | | |
|-----------|---------|------|------|
| EGF-like | PF00008 | 1383 | 1419 |
| Pentaxin | | 1431 | 1623 |
| Sushi/CCP | PF00084 | 1631 | 1685 |
| Sushi/CCP | PF00084 | 1690 | 1743 |
| EGF-like | PF00008 | 1748 | 1784 |
| Sushi/CCP | PF00084 | 1789 | 1842 |
| Sushi/CCP | PF00084 | 1847 | 1900 |
| Sushi/CCP | PF00084 | 1905 | 1958 |
| Sushi/CCP | PF00084 | 1963 | 2016 |
| Sushi/CCP | PF00084 | 2021 | 2078 |
| Sushi/CCP | PF00084 | 2083 | 2141 |
| Sushi/CCP | PF00084 | 2146 | 2199 |
| Sushi/CCP | PF00084 | 2204 | 2259 |
| Sushi/CCP | PF00084 | 2264 | 2318 |
| Sushi/CCP | PF00084 | 2323 | 2376 |
| Sushi/CCP | PF00084 | 2381 | 2435 |
| Sushi/CCP | PF00084 | 2440 | 2493 |
| Sushi/CCP | PF00084 | 2498 | 2551 |
| Sushi/CCP | PF00084 | 2556 | 2608 |
| Sushi/CCP | PF00084 | 2660 | 2712 |
| Sushi/CCP | PF00084 | 2717 | 2770 |
| Sushi/CCP | PF00084 | 2775 | 2828 |
| Sushi/CCP | PF00084 | 2833 | 2886 |
| Sushi/CCP | PF00084 | 2891 | 2944 |
| Sushi/CCP | PF00084 | 2949 | 3002 |
| Sushi/CCP | PF00084 | 3007 | 3059 |
| Sushi/CCP | PF00084 | 3064 | 3117 |
| Sushi/CCP | PF00084 | 3122 | 3176 |
| Sushi/CCP | PF00084 | 3181 | 3236 |
| Sushi/CCP | PF00084 | 3241 | 3294 |
| Sushi/CCP | PF00084 | 3299 | 3352 |
| Sushi/CCP | PF00084 | 3357 | 3411 |
| Sushi/CCP | PF00084 | 3416 | 3468 |

5

| | | | |
|----------|---------|------|------|
| EGF-like | PF00008 | 3468 | 3499 |
| EGF-like | PF00008 | 3504 | 3531 |
| EGF-like | PF00008 | 3536 | 3563 |

5 Table 3. Relative expression of CNGH0004 in 82 human tissues *

| Human RNA | Hs00295944 | Hs00225829 |
|---|------------|------------|
| Adrenal, Female, Adult | 10.03 | 8.38 |
| Aorta, Female, Fetal | 1.00 | 1.00 |
| Bladder, Male, Adult | 6.77 | 5.27 |
| Bladder, Diseased, Male, Adult | 1.42 | 0.51 |
| Bladder, Female, Fetal | 11.07 | 9.16 |
| Bladder, Male, Fetal | 9.54 | 7.75 |
| Brain, Female, Fetal | 1.85 | 1.39 |
| Brain, Male, Adult | 2.38 | 1.79 |
| Brain, Male, Fetal | 0.87 | 0.95 |
| Brain, Occipital Cortex, Male, Adult | 2.78 | 2.43 |
| Brain, Parietal Cortex, Male, Adult | 2.08 | 2.05 |
| Breast, Female, Adult | 6.02 | 4.89 |
| Caval Vein, Male, Adult | 7.86 | 6.16 |
| Cervix, Female, Adult | 6.30 | 5.13 |
| Colon, Female, Adult (Top) | 57.59 | 54.30 |
| Colon, Ascending, Female, Adult | 7.68 | 5.97 |
| Colon, Decending, Female, Adult | 6.26 | 5.10 |
| Colon, Normal, Male, Adult (Matched Set) | 5.46 | 4.44 |
| Colon, Diseased, Male, Adult (Matched Set) | 5.48 | 4.62 |
| Colon, Female, Fetal | 9.62 | 7.86 |
| Colon, Male, Adult | 4.57 | 3.46 |
| Colon, Male, Adult (Normal) | 7.15 | 5.95 |
| Colon, Male, Adult (Diseased) | 4.98 | 4.13 |
| Colon, Male, Fetal | 8.78 | 6.81 |
| Heart, Female, Adult | 1.65 | 1.61 |
| Heart, Female, Fetal | 5.91 | 4.83 |
| Heart, Left Atrium, Male, Adult | 2.53 | 2.26 |
| Heart, Male, Adult | 3.59 | 3.26 |
| Ileum, Diseased, Male, Adult | 3.07 | 2.17 |
| Ileum, Diseased, Male, Adult (Matched Set) | 3.45 | 2.52 |
| Ileum, Diseased, Male, Adult (Matched Set) | 2.88 | 1.86 |
| Kidney, Female, Fetal | 4.42 | 3.28 |
| Kidney, Diseased, Female, Adult (Matched Set) | 8.34 | 6.60 |
| Kidney, Diseased, Female, Adult (Matched Set) | 3.91 | 3.60 |
| Kidney, Female, Adult | 7.48 | 5.65 |
| Kidney, Male, Adult | 1.28 | 0.98 |
| Kidney, Male, Fetal | 7.10 | 5.89 |
| Larynx, Diseased, Male, Adult (Matched Set) | 4.74 | 3.67 |
| Larynx, Diseased, Male, Adult (Matched Set) | 2.66 | 0.91 |
| Larynx, Male, Adult | 5.52 | 4.38 |
| Larynx, Male, Adult | 2.84 | 0.92 |
| Larynx, Male, Adult (Normal) | 9.50 | 7.67 |
| Liver, Female, Adult | 0.91 | 0.61 |
| Liver, Female, Fetal | 1.44 | 1.19 |
| Liver, Male, Adult | 3.75 | 3.03 |

| | | |
|--|--------|--------|
| Liver, Male, Fetal | 1.69 | 1.36 |
| Lung, Female, Adult | 17.53 | 14.73 |
| Lung, Female, Fetal | 3.14 | 3.04 |
| Lung, Male, Adult | 11.47 | 9.77 |
| Lung, Male, Fetal | 8.69 | 7.67 |
| Lymph Node, Male, Adult | 2.33 | 1.79 |
| Ovary, Female, Adult | 23.13 | 17.83 |
| Pancreas, Male, Adult | 3.58 | 3.34 |
| Parotid, Female, Adult | 0.86 | 0.70 |
| Penis, Male, Adult | 8.64 | 6.83 |
| Pericardium, Male, Adult | 20.82 | 17.52 |
| Placenta, Adult, Female | 301.40 | 312.48 |
| Prostate, Male, Adult | 0.70 | 0.49 |
| Rectum, Male, Adult | 4.45 | 3.24 |
| Skeletal Muscle, Female, Fetal | 9.23 | 7.83 |
| Skeletal Muscle, Male, Adult | 6.32 | 5.32 |
| Skeletal Muscle, Male, Fetal | 9.57 | 8.85 |
| Skin, Female, Adult | 4.58 | 3.77 |
| Skin, Female, Fetal | 16.90 | 14.71 |
| Skin, Male, Adult | 28.13 | 23.60 |
| Spleen, Female, Adult | 5.82 | 4.61 |
| Spleen, Female/Male pooled, Fetal | 20.46 | 18.03 |
| Spleen, Male, Adult | 8.03 | 6.06 |
| Stomach, Diseased, Female, Adult (Matched Set) | 4.42 | 3.58 |
| Stomach, Diseased, Female, Adult (Matched Set) | 7.31 | 5.46 |
| Stomach, Female, Adult | 1.76 | 1.59 |
| Stomach, Female, Fetal | 13.89 | 10.74 |
| Stomach, Male, Adult | 3.12 | 2.12 |
| Stomach, Male, Fetal | 10.54 | 8.70 |
| Testes, Male, Adult | 14.52 | 12.14 |
| Thymus, Male and Female, Fetal | 1.21 | 0.89 |
| Thymus, Male, Adult | 15.42 | 12.14 |
| Thyroid, Female, Adult | 5.45 | 4.17 |
| Tongue, Male/Female, Adult | 7.27 | 5.91 |
| Trachea, Female, Adult | 5.90 | 4.60 |
| Uterus, Female, Adult | 7.94 | 5.72 |
| Vulva, Diseased, Female, Adult | 1.51 | 0.71 |

5

* Relative expression is calculated using a formula according to manufacturer's instruction (User Bulletin #2: ABI PRISM 7700 Sequence Detection System, Applied Biosystems, Foster City, CA). Evaluation of the copy number of mRNA of our gene of interest, CNGH0004, in specific tissues examined as shown in the table was compared with that of a calibrator tissue, in this case, Female Fetal

10 Aorta.

5 It will be clear that the invention can be practiced otherwise than as particularly described in the foregoing description and examples.

Numerous modifications and variations of the present invention are possible in light of the above teachings and, therefore, are within the scope of the appended claims.

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5 WHAT IS CLAIMED IS:

1. At least one CNGH0004 nucleic acid, comprising at least one polynucleotide comprising or complementary to the all of the contiguous nucleic acids 1001-11713 of SEQ ID NO:1.
2. At least one CNGH0004 nucleic acid, comprising at least one
10 polynucleotide comprising or complementary to at least 45 contiguous nucleotides 1001-11713 of SEQ ID NO:1.
3. At least one CNGH0004 nucleic acid, comprising at least one polynucleotide encoding the amino acid sequence of SEQ ID NO:2, or a polynucleotide complementary thereto.
4. At least one CNGH0004 nucleic acid, comprising at least one
15 polynucleotide having at least 95-99% identity to a nucleotide sequence comprising or complementary to all of the contiguous nucleotides 1001-11713 of SEQ ID NO:1.
5. At least one CNGH0004 nucleic acid, comprising at least one polynucleotide having at least 95-99% identity to a nucleotide sequence comprising or complementary
20 to at least 45 of the contiguous nucleotides 1001-11713 of SEQ ID NO:1.
6. At least one CNGH0004 nucleic acid, comprising at least one polynucleotide that hybridizes under stringent conditions to all of the contiguous nucleotides of SEQ ID NO:1 or a polynucleotide complementary thereto.
7. At least one CNGH0004 nucleic acid, comprising at least one
25 polynucleotide that hybridizes under stringent conditions to at least 45 contiguous nucleotides of SEQ ID NO:1 or a polynucleotide complementary thereto.
8. At least one CNGH0004 polypeptide, comprising all of the contiguous amino acids of SEQ ID NO:2.
9. At least one CNGH0004 polypeptide, comprising at least 15
30 contiguous amino acids of SEQ ID NO:2.
10. At least one CNGH0004 polypeptide, comprising at least one domain of SEQ ID NO:2.
11. At least one CNGH0004 polypeptide, comprising at least one polypeptide having at least 90-99% identity to an amino acid sequence comprising all of the contiguous
35 amino acids of SEQ ID NO:2.
12. At least one CNGH0004 polypeptide, comprising at least one polypeptide having at least 90-99% identity to an amino acid sequence comprising at least 15 of the

- 5 contiguous amino acids of SEQ ID NO:2.
13. At least one CNGH0004 polypeptide, comprising at least one polypeptide encoded by at least one polynucleotide that hybridizes under stringent conditions to all of the contiguous nucleotides SEQ ID NO:1 or a polynucleotide complementary thereto.
- 10 14. At least one CNGH0004 polypeptide, comprising at least one polypeptide encoded by at least one polynucleotide that hybridizes under stringent conditions to at least 45 of the contiguous nucleotides SEQ ID NO:1 or a polynucleotide complementary thereto.
- 15 15. At least one CNGH0004 polypeptide, comprising at least one of 1-82, 83-259, 259-377, 378-433, 434-438, 438-493, 498-559, 1631-1685, 1690-1743, 1789-1842, 2021-2078, 2083-2141, 2146-2199, 2204-2259, 2264-2318, 2323-2376, 2381-2435, 2440-2493, 2498-2551, 2556-2608, 2660-2712, 2717-2770, 2775-2828, 2833-2886, 2891-2944, 2949-3002, 3007-3059, 3064-3117, 3122-3176, 3181-3236, 3241-3294, 3299-3352, 3357-3411, 3416-3468, 1231-1267, 1269-1305, 1307-1343, 1345-1381, 1383-1419, 1748-1784, 3468-3499, 3504-3531, 3536-3563, 1431-1623, 643-722, 561-642, 1196-1229, 727-787, 1847-1900, 1963-2016, 1905-1958, 999-1036, 1041-1106, 1108-1160, 1-41, or 305-360 of SEQ ID NO:1.
- 20 16. A CNGH0004 nucleic acid or CNGH0004 polypeptide according to any of claims 1-15, wherein said polypeptide has at least one activity of at least one CNGH0004 polypeptide.
- 25 17. A CNGH0004 antibody, comprising a monoclonal or polyclonal antibody, fusion protein, or fragment thereof, that specifically binds at least one CNGH0004 polypeptide according to any of claims 1-15.
18. A CNGH0004 nucleic acid encoding at least one CNGH0004 polypeptide or CNGH0004 antibody according to any of claim 1-17.
19. A CNGH0004 vector comprising at least one isolated nucleic acid according to any of claims 1-7.
- 30 20. A CNGH0004 host cell comprising an isolated nucleic acid according to claim 18.
21. A CNGH0004 host cell according to claim 20, wherein said host cell is at least one selected from COS-1, COS-7, HEK293, BHK21, CHO, BSC-1, Hep G2, 653, SP2/0, 293, NSO, DG44 CHO, CHO K1, HeLa, myeloma, or lymphoma cells, or any derivative, immortalized or 35 transformed cell thereof.
22. A method for producing at least one CNGH0004 polypeptide or CNGH0004 antibody, comprising translating a nucleic acid according to claim 18 under conditions in

5 vitro, in vivo or in situ, such that the CNGH0004 polypeptide is expressed in detectable or recoverable amounts.

23. A composition comprising at least one CNGH0004 nucleic acid, CNGH0004 polypeptide, or CNGH0004 antibody according to any of claims 1-17.

10 24. A composition according to claim 23, wherein said composition further comprises at least one pharmaceutically acceptable carrier or diluent.

15 25. A composition according to claim 23, further comprising at least one composition comprising an therapeutically effective amount of at least one compound, composition or polypeptide selected from at least one of a detectable label or reporter, a TNF antagonist, an anti-infective drug, a cardiovascular (CV) system drug, a central nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a nutritional drug, a cytokine, or a cytokine antagonist.

20 26. A composition according to claim 23, in a form of at least one selected from a liquid, gas, or dry, solution, mixture, suspension, emulsion or colloid, a lyophilized preparation, a powder.

27. A method for diagnosing or treating a CNGH0004 related condition in a cell, tissue, organ or animal, comprising

25 (a) contacting or administering a composition comprising an effective amount of at least one CNGH0004 nucleic acid, polypeptide or antibody according to any of claims 1-17, with, or to, said cell, tissue, organ or animal.

28. A method according to claim 27, wherein said effective amount is 0.001-50 mg of CNGH0004 antibody; 0.000001-500 mg of said CNGH0004 polypeptide; or 0.0001-100µg of said CNGH0004 nucleic acid per kilogram of said cells, tissue, organ or animal.

30 29. A method according to claim 27, wherein said contacting or said administrating is by at least one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intrabronchial, intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelial, intracelebellar, intracerebroventricular, intracolonic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, 35 intraprostatic, intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal.

5 30. A method according to claim 27, further comprising administering,
prior, concurrently or after said (a) contacting or administering, at least one composition comprising an
effective amount of at least one compound or polypeptide selected from at least one of a detectable
label or reporter, a TNF antagonist, an anti-infective drug, a cardiovascular (CV) system drug, a central
nervous system (CNS) drug, an autonomic nervous system (ANS) drug, a respiratory tract drug, a
10 gastrointestinal (GI) tract drug, a hormonal drug, a drug for fluid or electrolyte balance, a hematologic
drug, an antineoplastic, an immunomodulation drug, an ophthalmic, otic or nasal drug, a topical drug, a
nutritional drug, a cytokine, or a cytokine antagonist.

 31. A device, comprising at least one isolated CNGH0004 polypeptide,
antibody or nucleic acid according to any of claims 1-17, wherein said device is suitable for contacting
15 or administering said at least one of said CNGH0004 polypeptide, antibody or nucleic acid, by at least
one mode selected from parenteral, subcutaneous, intramuscular, intravenous, intrarticular,
intraabdominal, intracapsular, intracartilaginous, intracavitary, intracelical,
intracerebellar, intracerebroventricular, intracolonic, intracervical, intragastric, intrahepatic,
intramyocardial, intraosteal, intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic,
20 intrapulmonary, intrarectal, intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine,
intravesical, intralesional, bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal.

 32. An article of manufacture for human pharmaceutical or diagnostic use,
comprising packaging material and a container comprising at least one isolated CNGH0004
polypeptide, antibody or nucleic acid according to any of claims 1-17.

25 33. The article of manufacture of claim 32, wherein said container is a
component of a parenteral, subcutaneous, intramuscular, intravenous, intrarticular, intraabdominal,
intracapsular, intracartilaginous, intracavitary, intracelical, intracerebellar,
intracerebroventricular, intracolonic, intracervical, intragastric, intrahepatic, intramyocardial, intraosteal,
intrapelvic, intrapericardiac, intraperitoneal, intrapleural, intraprostatic, intrapulmonary, intrarectal,
30 intrarenal, intraretinal, intraspinal, intrasynovial, intrathoracic, intrauterine, intravesical, intralesional,
bolus, vaginal, rectal, buccal, sublingual, intranasal, or transdermal delivery device or system.

 34. A method for producing at least one isolated CNGH0004 polypeptide,
antibody or nucleic acid according to any of claims 1-17, comprising providing at least one host cell,
transgenic animal, transgenic plant, plant cell capable of expressing in detectable or recoverable
35 amounts said polypeptide, antibody or nucleic acid.

5 35. At least one CNGH0004 polypeptide, antibody or nucleic acid,
produced by a method according to claim 34.

5 SEQUENCE LISTING

<110> Huang, Chris

Song, Xiao-yu

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40

1 5

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 280 285 290

5 tgc aaa tgt ggg aca cac aca ggc cat ttt gag tgc atc tgt gaa aag 1927
 Cys Lys Cys Gly Thr His Thr Gly His Phe Glu Cys Ile Cys Glu Lys
 295 300 305
 ggg tat tac ggg aaa ggt ctg cag tat gaa tgc aca gct tgc cca tcg 1975
 Gly Tyr Tyr Gly Lys Gly Leu Gln Tyr Glu Cys Thr Ala Cys Pro Ser
 10 310 315 320 325
 ggg aca tac aaa cct gaa ggc tca cca gga gga atc agc agt tgc att 2023
 Gly Thr Tyr Lys Pro Glu Gly Ser Pro Gly Gly Ile Ser Ser Cys Ile
 330 335 340
 cca tgt cct gat gaa aat cac acc tct cca cct gga agc aca tcc cct 2071
 Pro Cys Pro Asp Glu Asn His Thr Ser Pro Pro Gly Ser Thr Ser Pro
 345 350 355
 gaa gac tgt gtc tgc aga gag gga tac agg gca tct ggc cag acc tgt 2119
 Glu Asp Cys Val Cys Arg Glu Gly Tyr Arg Ala Ser Gly Gln Thr Cys
 360 365 370
 20 gaa ctt gtc cac tgc cct gcc ctg aag cct ccc gaa aat ggt tac ttt 2167
 Glu Leu Val His Cys Pro Ala Leu Lys Pro Pro Glu Asn Gly Tyr Phe
 375 380 385
 atc caa aac act tgc aac aac cac ttc aat gca gcc tgt ggg gtc cga 2215
 Ile Gln Asn Thr Cys Asn Asn His Phe Asn Ala Ala Cys Gly Val Arg
 25 390 395 400 405
 tgt cac cct gga ttt gat ctt gtg gga agc agc atc atc tta tgt cta 2263
 Cys His Pro Gly Phe Asp Leu Val Gly Ser Ser Ile Ile Leu Cys Leu
 410 415 420
 ccc aat ggt ttg tgg tcc ggt tca gag agc tac tgc aga gta aga aca 2311
 Pro Asn Gly Leu Trp Ser Gly Ser Glu Ser Tyr Cys Arg Val Arg Thr
 425 430 435
 tgt cct cat ctc cgc cag ccg aaa cat ggc cac atc agc tgt tct aca 2359
 Cys Pro His Leu Arg Gln Pro Lys His Gly His Ile Ser Cys Ser Thr
 440 445 450
 35 agg gaa atg tta tat aag aca aca tgt ttg gtt gcc tgt gat gaa ggg 2407
 Arg Glu Met Leu Tyr Lys Thr Thr Cys Leu Val Ala Cys Asp Glu Gly
 455 460 465
 tac aga cta gaa ggc agt gat aag ctt act tgt caa gga aac agc cag 2455
 Tyr Arg Leu Glu Gly Ser Asp Lys Leu Thr Cys Gln Gly Asn Ser Gln
 40 470 475 480 485
 tgg gat ggg cca gaa ccc cgg tgt gtg gag cgc cac tgt tcc acc ttt 2503
 Trp Asp Gly Pro Glu Pro Arg Cys Val Glu Arg His Cys Ser Thr Phe
 490 495 500
 cag atg ccc aaa gat gtc atc ata tcc ccc cac aac tgt ggc aag cag 2551
 Gln Met Pro Lys Asp Val Ile Ile Ser Pro His Asn Cys Gly Lys Gln
 505 510 515
 45 cca gcc aaa ttt ggg acg atc tgc tat gta agt tgc cgc caa ggg ttc 2599
 Pro Ala Lys Phe Gly Thr Ile Cys Tyr Val Ser Cys Arg Gln Gly Phe
 520 525 530

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|----|---|------|
| 5 | att tta tct gga gtc aaa gaa atg ctg aga tgt acc act tct gga aaa | 2647 |
| | Ile Leu Ser Gly Val Lys Glu Met Leu Arg Cys Thr Thr Ser Gly Lys | |
| | 535 540 545 | |
| | tgg aat gtc gga gtt cag gca gct gtg tgt aaa gac gtg gag gct cct | 2695 |
| | Trp Asn Val Gly Val Gln Ala Ala Val Cys Lys Asp Val Glu Ala Pro | |
| 10 | 550 555 560 565 | |
| | caa atc aac tgt cct aag gac ata gag gct aag act ctg gaa cag caa | 2743 |
| | Gln Ile Asn Cys Pro Lys Asp Ile Glu Ala Lys Thr Leu Glu Gln Gln | |
| | 570 575 580 | |
| | gat tct gcc aat gtt acc tgg cag att cca aca gct aaa gac aac tct | 2791 |
| 15 | Asp Ser Ala Asn Val Thr Trp Gln Ile Pro Thr Ala Lys Asp Asn Ser | |
| | 585 590 595 | |
| | ggg gaa aag gtg tca gtc cac gtt cat cca gct ttc acc cca cct tac | 2839 |
| | Gly Glu Lys Val Ser Val His Val His Pro Ala Phe Thr Pro Pro Tyr | |
| | 600 605 610 | |
| 20 | ctt ttc cca att gga gat gtt gct atc gta tac acg gca act gac cta | 2887 |
| | Leu Phe Pro Ile Gly Asp Val Ala Ile Val Tyr Thr Ala Thr Asp Leu | |
| | 615 620 625 | |
| | tcc ggc aac cag gcc agc tgc att ttc cat atc aag gtt att gat gca | 2935 |
| | Ser Gly Asn Gln Ala Ser Cys Ile Phe His Ile Lys Val Ile Asp Ala | |
| 25 | 630 635 640 645 | |
| | gaa cca cct gtc ata gac tgg tgc aga tct cca cct ccc gtc cag gtc | 2983 |
| | Glu Pro Pro Val Ile Asp Trp Cys Arg Ser Pro Pro Pro Val Gln Val | |
| | 650 655 660 | |
| | tcg gag aag gta cat gcc gca agc tgg gat gag cct cag ttc tca gac | 3031 |
| 30 | Ser Glu Lys Val His Ala Ala Ser Trp Asp Glu Pro Gln Phe Ser Asp | |
| | 665 670 675 | |
| | aac tca ggg gct gaa ttg gtc att acc aga agt cat aca caa gga gac | 3079 |
| | Asn Ser Gly Ala Glu Leu Val Ile Thr Arg Ser His Thr Gln Gly Asp | |
| | 680 685 690 | |
| 35 | ctt ttc cct caa ggg gag act ata gta cag tat aca gcc act gac ccc | 3127 |
| | Leu Phe Pro Gln Gly Glu Thr Ile Val Gln Tyr Thr Ala Thr Asp Pro | |
| | 695 700 705 | |
| | tca ggc aat aac agg aca tgt gat atc cat att gtc ata aaa ggt tct | 3175 |
| | Ser Gly Asn Asn Arg Thr Cys Asp Ile His Ile Val Ile Lys Gly Ser | |
| 40 | 710 715 720 725 | |
| | ccc tgt gaa att cca ttc aca cct gta aat ggg gat ttt ata tgc act | 3223 |
| | Pro Cys Glu Ile Pro Phe Thr Pro Val Asn Gly Asp Phe Ile Cys Thr | |
| | 730 735 740 | |
| | cca gat aat act gga gtc aac tgt aca tta act tgc ttg gag ggc tat | 3271 |
| 45 | Pro Asp Asn Thr Gly Val Asn Cys Thr Leu Thr Cys Leu Glu Gly Tyr | |
| | 745 750 755 | |
| | gat ttc aca gaa ggg tct act gac aag tat tat tgt gct tat gaa gat | 3319 |
| | Asp Phe Thr Glu Gly Ser Thr Asp Lys Tyr Tyr Cys Ala Tyr Glu Asp | |
| | 760 765 770 | |

5 ggc gtc tgg aaa cca aca tat acc act gaa tgg cca gac tgt gcc aaa 3367
 Gly Val Trp Lys Pro Thr Tyr Thr Thr Glu Trp Pro Asp Cys Ala Lys
 775 780 785
 aaa cgt ttt gca aac cac ggg ttc aag tcc ttt gag atg ttc tac aaa 3415
 Lys Arg Phe Ala Asn His Gly Phe Lys Ser Phe Glu Met Phe Tyr Lys
 10 790 795 800 805
 gca gct cgt tgt gat gac aca gat ctg atg aag aag ttt tct gaa gca 3463
 Ala Ala Arg Cys Asp Asp Thr Asp Leu Met Lys Lys Phe Ser Glu Ala
 810 815 820
 ttt gag acg acc ctg gga aaa atg gtc cca tca ttt tgt agt gat gca 3511
 15 Phe Glu Thr Thr Leu Gly Lys Met Val Pro Ser Phe Cys Ser Asp Ala
 825 830 835
 gag gac att gac tgc aga ctg gag gag aac ctg acc aaa aaa tat tgc 3559
 Glu Asp Ile Asp Cys Arg Leu Glu Glu Asn Leu Thr Lys Lys Tyr Cys
 840 845 850
 20 cta gaa tat aat tat gac tat gaa aat ggc ttt gca att gga cca ggt 3607
 Leu Glu Tyr Asn Tyr Asp Tyr Glu Asn Gly Phe Ala Ile Gly Pro Gly
 855 860 865
 ggc tgg ggt gca gct aat agg ctg gat tac tct tac gat gac ttc ctg 3655
 Gly Trp Gly Ala Ala Asn Arg Leu Asp Tyr Ser Tyr Asp Asp Phe Leu
 25 870 875 880 885
 gac act gtg caa gaa aca gcc aca agc atc ggc aat gcc aag tcc tca 3703
 Asp Thr Val Gln Glu Thr Ala Thr Ser Ile Gly Asn Ala Lys Ser Ser
 890 895 900
 egg att aaa aga agt gcc cca tta tct gac tat aaa att aag tta att 3751
 30 Arg Ile Lys Arg Ser Ala Pro Leu Ser Asp Tyr Lys Ile Lys Leu Ile
 905 910 915
 ttt aac atc aca gct agt gtg cca tta ccc gat gaa aga aat gat acc 3799
 Phe Asn Ile Thr Ala Ser Val Pro Leu Pro Asp Glu Arg Asn Asp Thr
 920 925 930
 35 ctt gaa tgg gaa aat cag caa cga ctc ctt cag aca ttg gaa act atc 3847
 Leu Glu Trp Glu Asn Gln Gln Arg Leu Leu Gln Thr Leu Glu Thr Ile
 935 940 945
 aca aat aaa ctg aaa agg act ctc aac aaa gac ccc atg tat tcc ttt 3895
 Thr Asn Lys Leu Lys Arg Thr Leu Asn Lys Asp Pro Met Tyr Ser Phe
 40 950 955 960 965
 cag ctt gca tca gaa ata ctt ata gcc gac agc aat tca tta gaa aca 3943
 Gln Leu Ala Ser Glu Ile Leu Ile Ala Asp Ser Asn Ser Leu Glu Thr
 970 975 980
 aaa aag gct tcc ccc ttc tgc aga cca ggc tca gtg ctg aga ggg cgt 3991
 45 Lys Lys Ala Ser Pro Phe Cys Arg Pro Gly Ser Val Leu Arg Gly Arg
 985 990 995
 atg tgt gtc aat tgc cct ttg gga acc tat tat aat ctg gaa cat 4036
 Met Cys Val Asn Cys Pro Leu Gly Thr Tyr Tyr Asn Leu Glu His
 1000 1005 1010

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|----|---|------|
| 5 | ttc acc tgt gaa agc tgc cgg atc gga tcc tat caa gat gaa gaa | 4081 |
| | Phe Thr Cys Glu Ser Cys Arg Ile Gly Ser Tyr Gln Asp Glu Glu | |
| | 1015 1020 1025 | |
| | ggg caa ctt gag tgc aag ctt tgc ccc tct ggg atg tac acg gaa | 4126 |
| | Gly Gln Leu Glu Cys Lys Leu Cys Pro Ser Gly Met Tyr Thr Glu | |
| 10 | 1030 1035 1040 | |
| | tat atc cat tca aga aac atc tct gat tgt aaa gct cag tgt aaa | 4171 |
| | Tyr Ile His Ser Arg Asn Ile Ser Asp Cys Lys Ala Gln Cys Lys | |
| | 1045 1050 1055 | |
| | caa ggc acc tac tca tac agt gga ctt gag act tgt gaa tcg tgt | 4216 |
| 15 | Gln Gly Thr Tyr Ser Tyr Ser Gly Leu Glu Thr Cys Glu Ser Cys | |
| | 1060 1065 1070 | |
| | cca ctg ggc act tat cag cca aaa ttt ggt tcc cgg agc tgc ctc | 4261 |
| | Pro Leu Gly Thr Tyr Gln Pro Lys Phe Gly Ser Arg Ser Cys Leu | |
| | 1075 1080 1085 | |
| 20 | tcg tgt cca gaa aac acc tca act gtg aaa aga gga gcc gtg aac | 4306 |
| | Ser Cys Pro Glu Asn Thr Ser Thr Val Lys Arg Gly Ala Val Asn | |
| | 1090 1095 1100 | |
| | att tct gca tgt gga gtt cct tgt cca gaa gga aaa ttc tcg cgt | 4351 |
| | Ile Ser Ala Cys Gly Val Pro Cys Pro Glu Gly Lys Phe Ser Arg | |
| 25 | 1105 1110 1115 | |
| | tct ggg tta atg ccc tgt cac cca tgt cct cgt gac tat tac caa | 4396 |
| | Ser Gly Leu Met Pro Cys His Pro Cys Pro Arg Asp Tyr Tyr Gln | |
| | 1120 1125 1130 | |
| | cct aat gca ggg aag gcc ttc tgc ctg gcc tgt ccc ttt tat gga | 4441 |
| 30 | Pro Asn Ala Gly Lys Ala Phe Cys Leu Ala Cys Pro Phe Tyr Gly | |
| | 1135 1140 1145 | |
| | act acc cca ttc gct ggt tcc aga tcc atc aca gaa tgt tca agt | 4486 |
| | Thr Thr Pro Phe Ala Gly Ser Arg Ser Ile Thr Glu Cys Ser Ser | |
| | 1150 1155 1160 | |
| 35 | ttt agt tca act ttc tca gcg gca gag gaa agt gtg gtg ccc cct | 4531 |
| | Phe Ser Ser Thr Phe Ser Ala Ala Glu Glu Ser Val Val Pro Pro | |
| | 1165 1170 1175 | |
| | gcc tct ctt gga cat att aaa aag agg cat gaa atc agc agt cag | 4576 |
| | Ala Ser Leu Gly His Ile Lys Lys Arg His Glu Ile Ser Ser Gln | |
| 40 | 1180 1185 1190 | |
| | gtt ttc cat gaa tgc ttc ttt aac cct tgc cac aat agt gga acc | 4621 |
| | Val Phe His Glu Cys Phe Phe Asn Pro Cys His Asn Ser Gly Thr | |
| | 1195 1200 1205 | |
| | tgc cag caa ctt ggg cgt ggt tat gtt tgt ctc tgt cca ctt gga | 4666 |
| 45 | Cys Gln Gln Leu Gly Arg Gly Tyr Val Cys Leu Cys Pro Leu Gly | |
| | 1210 1215 1220 | |
| | tat aca ggc tta aag tgt gaa aca gac atc gat gag tgc agc cca | 4711 |
| | Tyr Thr Gly Leu Lys Cys Glu Thr Asp Ile Asp Glu Cys Ser Pro | |
| | 1225 1230 1235 | |

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|----|---|------|
| 5 | ctg cct tgc ctc aac aat gga gtt tgt aaa gac cta gtt ggg gaa | 4756 |
| | Leu Pro Cys Leu Asn Asn Gly Val Cys Lys Asp Leu Val Gly Glu | |
| | 1240 1245 1250 | |
| | ttc att tgt gag tgc cca tca ggt tac aca ggt cag egg tgt gaa | 4801 |
| | Phe Ile Cys Glu Cys Pro Ser Gly Tyr Thr Gly Gln Arg Cys Glu | |
| 10 | 1255 1260 1265 | |
| | gaa aat ata aat gag tgt agc tcc agt cct tgt tta aat aaa gga | 4846 |
| | Glu Asn Ile Asn Glu Cys Ser Ser Ser Pro Cys Leu Asn Lys Gly | |
| | 1270 1275 1280 | |
| | atc tgt gtt gat ggt gtg gct ggc tat cgt tgc aca tgt gtg aaa | 4891 |
| 15 | Ile Cys Val Asp Gly Val Ala Gly Tyr Arg Cys Thr Cys Val Lys | |
| | 1285 1290 1295 | |
| | gga ttt gta ggc ctg cat tgt gaa aca gaa gtc aat gaa tgc cag | 4936 |
| | Gly Phe Val Gly Leu His Cys Glu Thr Glu Val Asn Glu Cys Gln | |
| | 1300 1305 1310 | |
| 20 | tca aac cca tgc tta aat aat gca gtc tgt gaa gac cag gtt ggg | 4981 |
| | Ser Asn Pro Cys Leu Asn Asn Ala Val Cys Glu Asp Gln Val Gly | |
| | 1315 1320 1325 | |
| | gga ttc ttg tgc aaa tgc cca cct gga ttt ttg ggt acc cga tgt | 5026 |
| | Gly Phe Leu Cys Lys Cys Pro Pro Gly Phe Leu Gly Thr Arg Cys | |
| 25 | 1330 1335 1340 | |
| | gga aag aac gtc gat gag tgt ctc agt cag cca tgc aaa aat gga | 5071 |
| | Gly Lys Asn Val Asp Glu Cys Leu Ser Gln Pro Cys Lys Asn Gly | |
| | 1345 1350 1355 | |
| | gct acc tgt aaa gac ggt gcc aat agc ttc aga tgc ctg tgt gca | 5116 |
| 30 | Ala Thr Cys Lys Asp Gly Ala Asn Ser Phe Arg Cys Leu Cys Ala | |
| | 1360 1365 1370 | |
| | gct ggc ttc aca gga tca cac tgt gaa ttg aac atc aat gaa tgt | 5161 |
| | Ala Gly Phe Thr Gly Ser His Cys Glu Leu Asn Ile Asn Glu Cys | |
| | 1375 1380 1385 | |
| 35 | cag tct aat cca tgt aga aat cag gcc acc tgt gtg gat gaa tta | 5206 |
| | Gln Ser Asn Pro Cys Arg Asn Gln Ala Thr Cys Val Asp Glu Leu | |
| | 1390 1395 1400 | |
| | aat tca tac agt tgt aaa tgt cag cca gga ttt tca ggc aaa agg | 5251 |
| | Asn Ser Tyr Ser Cys Lys Cys Gln Pro Gly Phe Ser Gly Lys Arg | |
| 40 | 1405 1410 1415 | |
| | tgt gaa aca gaa cag tct aca ggc ttt aac ctg gat ttt gaa gtt | 5296 |
| | Cys Glu Thr Glu Gln Ser Thr Gly Phe Asn Leu Asp Phe Glu Val | |
| | 1420 1425 1430 | |
| | tct ggc atc tat gga tat gtc atg cta gat ggc atg ctc cca tct | 5341 |
| 45 | Ser Gly Ile Tyr Gly Tyr Val Met Leu Asp Gly Met Leu Pro Ser | |
| | 1435 1440 1445 | |
| | ctc cat gct cta acc tgt acc ttc tgg atg aaa tcc tct gac gac | 5386 |
| | Leu His Ala Leu Thr Cys Thr Phe Trp Met Lys Ser Ser Asp Asp | |
| | 1450 1455 1460 | |

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|----|---|------|
| 5 | atg aac tat gga aca cca atc tcc tat gca gtt gat aac ggc agc | 5431 |
| | Met Asn Tyr Gly Thr Pro Ile Ser Tyr Ala Val Asp Asn Gly Ser | |
| | 1465 1470 1475 | |
| | gac aat acc ttg ctc ctg act gat tat aac ggc tgg gtt ctt tat | 5476 |
| | Asp Asn Thr Leu Leu Leu Thr Asp Tyr Asn Gly Trp Val Leu Tyr | |
| 10 | 1480 1485 1490 | |
| | gtg aat ggc agg gaa aag ata aca aac tgt ccc tcg gtg aat gat | 5521 |
| | Val Asn Gly Arg Glu Lys Ile Thr Asn Cys Pro Ser Val Asn Asp | |
| | 1495 1500 1505 | |
| | ggc aga tgg cat cat att gca atc act tgg aca agt gcc aat ggc | 5566 |
| 15 | Gly Arg Trp His His Ile Ala Ile Thr Trp Thr Ser Ala Asn Gly | |
| | 1510 1515 1520 | |
| | atc tgg aaa gtc tat atc gat ggg aaa tta tct gac ggt ggt gct | 5611 |
| | Ile Trp Lys Val Tyr Ile Asp Gly Lys Leu Ser Asp Gly Gly Ala | |
| | 1525 1530 1535 | |
| 20 | ggc ctc tct gtt ggt ttg ccc ata cct ggt ggt ggt gcg tta gtt | 5656 |
| | Gly Leu Ser Val Gly Leu Pro Ile Pro Gly Gly Gly Ala Leu Val | |
| | 1540 1545 1550 | |
| | ctg ggg caa gag caa gac aaa aaa gga gag gga ttc agc cca gct | 5701 |
| | Leu Gly Gln Glu Gln Asp Lys Lys Gly Glu Gly Phe Ser Pro Ala | |
| 25 | 1555 1560 1565 | |
| | gag tct ttt gtg ggc tcc ata agc cag ctc aac ctc tgg gac tat | 5746 |
| | Glu Ser Phe Val Gly Ser Ile Ser Gln Leu Asn Leu Trp Asp Tyr | |
| | 1570 1575 1580 | |
| | gtc ctg tct cca cag cag gtg aag tca ctg gct acc tcc tgc cca | 5791 |
| 30 | Val Leu Ser Pro Gln Gln Val Lys Ser Leu Ala Thr Ser Cys Pro | |
| | 1585 1590 1595 | |
| | gag gaa ctc agt aaa gga aac gtg tta gca tgg cct gat ttc ttg | 5836 |
| | Glu Glu Leu Ser Lys Gly Asn Val Leu Ala Trp Pro Asp Phe Leu | |
| | 1600 1605 1610 | |
| 35 | tca gga att gtg ggg aaa gtg aag atc gat tct aag agc ata ttt | 5881 |
| | Ser Gly Ile Val Gly Lys Val Lys Ile Asp Ser Lys Ser Ile Phe | |
| | 1615 1620 1625 | |
| | tgt tct gat tgc cca cgc tta gga ggg tca gtg cct cat ctg aga | 5926 |
| | Cys Ser Asp Cys Pro Arg Leu Gly Gly Ser Val Pro His Leu Arg | |
| 40 | 1630 1635 1640 | |
| | act gca tct gaa gat tta aag cca ggt tcc aaa gtc aat ctg ttc | 5971 |
| | Thr Ala Ser Glu Asp Leu Lys Pro Gly Ser Lys Val Asn Leu Phe | |
| | 1645 1650 1655 | |
| | tgt gat cca ggc ttc cag ctg gtc ggg aac cct gtg cag tac tgt | 6016 |
| 45 | Cys Asp Pro Gly Phe Gln Leu Val Gly Asn Pro Val Gln Tyr Cys | |
| | 1660 1665 1670 | |
| | ctg aat caa gga cag tgg aca caa cca ctt cct cac tgt gaa cgc | 6061 |
| | Leu Asn Gln Gly Gln Trp Thr Gln Pro Leu Pro His Cys Glu Arg | |
| | 1675 1680 1685 | |

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|----|---|------|
| 5 | att agc tgt ggg gtg cca cct cct ttg gag aat ggc ttc cat tca | 6106 |
| | Ile Ser Cys Gly Val Pro Pro Pro Leu Glu Asn Gly Phe His Ser | |
| | 1690 1695 1700 | |
| | gcc gat gac ttc tat gct ggc agc aca gta acc tac cag tgc aac | 6151 |
| | Ala Asp Asp Phe Tyr Ala Gly Ser Thr Val Thr Tyr Gln Cys Asn | |
| 10 | 1705 1710 1715 | |
| | aat ggc tac tat cta ttg ggt gac tca agg atg ttc tgt aca gat | 6196 |
| | Asn Gly Tyr Tyr Leu Leu Gly Asp Ser Arg Met Phe Cys Thr Asp | |
| | 1720 1725 1730 | |
| | aat ggg agc tgg aac ggc gtt tca cca tcc tgc ctt gat gtc gat | 6241 |
| 15 | Asn Gly Ser Trp Asn Gly Val Ser Pro Ser Cys Leu Asp Val Asp | |
| | 1735 1740 1745 | |
| | gag tgt gca gtt gga tca gat tgt agt gag cat gct tct tgc ctg | 6286 |
| | Glu Cys Ala Val Gly Ser Asp Cys Ser Glu His Ala Ser Cys Leu | |
| | 1750 1755 1760 | |
| 20 | aac gta gat gga tcc tac ata tgt tca tgt gtc cca ccg tac aca | 6331 |
| | Asn Val Asp Gly Ser Tyr Ile Cys Ser Cys Val Pro Pro Tyr Thr | |
| | 1765 1770 1775 | |
| | gga gat ggg aaa aac tgt gca gaa cct ata aaa tgt aag gct cca | 6376 |
| | Gly Asp Gly Lys Asn Cys Ala Glu Pro Ile Lys Cys Lys Ala Pro | |
| 25 | 1780 1785 1790 | |
| | gga aat ccg gaa aat ggc cac tcc tca ggt gag att tat aca gta | 6421 |
| | Gly Asn Pro Glu Asn Gly His Ser Ser Gly Glu Ile Tyr Thr Val | |
| | 1795 1800 1805 | |
| | ggt gcc gca gtc aca ttt tcg tgt cag gaa gga tac cag ttg atg | 6466 |
| 30 | Gly Ala Ala Val Thr Phe Ser Cys Gln Glu Gly Tyr Gln Leu Met | |
| | 1810 1815 1820 | |
| | gga gta acc aaa atc aca tgt ttg gag tct gga gaa tgg aat cat | 6511 |
| | Gly Val Thr Lys Ile Thr Cys Leu Glu Ser Gly Glu Trp Asn His | |
| | 1825 1830 1835 | |
| 35 | cta ata cca tat tgt aaa gct gtt tca tgt ggt aaa ccg gct att | 6556 |
| | Leu Ile Pro Tyr Cys Lys Ala Val Ser Cys Gly Lys Pro Ala Ile | |
| | 1840 1845 1850 | |
| | cca gaa aat ggt tgc att gag gag tta gca ttt act ttt ggc agc | 6601 |
| | Pro Glu Asn Gly Cys Ile Glu Glu Leu Ala Phe Thr Phe Gly Ser | |
| 40 | 1855 1860 1865 | |
| | aaa gtg aca tat agg tgt aat aaa gga tat act ctg gcc ggt gat | 6646 |
| | Lys Val Thr Tyr Arg Cys Asn Lys Gly Tyr Thr Leu Ala Gly Asp | |
| | 1870 1875 1880 | |
| | aaa gaa tca tcc tgt ctt gct aac agt tct tgg agt cat tcc cct | 6691 |
| 45 | Lys Glu Ser Ser Cys Leu Ala Asn Ser Ser Trp Ser His Ser Pro | |
| | 1885 1890 1895 | |
| | cct gtg tgt gaa cca gtg aag tgt tct agt ccg gaa aat ata aat | 6736 |
| | Pro Val Cys Glu Pro Val Lys Cys Ser Ser Pro Glu Asn Ile Asn | |
| | 1900 1905 1910 | |

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|----|---|------|
| 5 | aat gga aaa tat att ttg agt ggg ctt acc tac ctt tct act gca | 6781 |
| | Asn Gly Lys Tyr Ile Leu Ser Gly Leu Thr Tyr Leu Ser Thr Ala | |
| | 1915 1920 1925 | |
| | tca tat tca tgc gat aca gga tac agc tta cag ggc cct tcc att | 6826 |
| | Ser Tyr Ser Cys Asp Thr Gly Tyr Ser Leu Gln Gly Pro Ser Ile | |
| 10 | 1930 1935 1940 | |
| | att gaa tgc acg gct tct ggc atc tgg gac aga gcg cca cct gcc | 6871 |
| | Ile Glu Cys Thr Ala Ser Gly Ile Trp Asp Arg Ala Pro Pro Ala | |
| | 1945 1950 1955 | |
| | tgt cac ctc gtc ttc tgt gga gaa cca cct gcc atc aaa gat gct | 6916 |
| 15 | Cys His Leu Val Phe Cys Gly Glu Pro Pro Ala Ile Lys Asp Ala | |
| | 1960 1965 1970 | |
| | gtc att acg ggg aat aac ttc act ttc agg aac acc gtc act tac | 6961 |
| | Val Ile Thr Gly Asn Asn Phe Thr Phe Arg Asn Thr Val Thr Tyr | |
| | 1975 1980 1985 | |
| 20 | act tgc aaa gaa ggc tat act ctt gct ggt ctt gac acc att gaa | 7006 |
| | Thr Cys Lys Glu Gly Tyr Thr Leu Ala Gly Leu Asp Thr Ile Glu | |
| | 1990 1995 2000 | |
| | tgc ctg gcc gac ggc aag tgg agt aga agt gac cag cag tgc ctg | 7051 |
| | Cys Leu Ala Asp Gly Lys Trp Ser Arg Ser Asp Gln Gln Cys Leu | |
| 25 | 2005 2010 2015 | |
| | gct gtc tcc tgt gat gag cca ccc att gtg gac cac gcc tct cca | 7096 |
| | Ala Val Ser Cys Asp Glu Pro Pro Ile Val Asp His Ala Ser Pro | |
| | 2020 2025 2030 | |
| | gag act gcc cat cgg ctc ttt gga gac att gca ttc tac tac tgc | 7141 |
| 30 | Glu Thr Ala His Arg Leu Phe Gly Asp Ile Ala Phe Tyr Tyr Cys | |
| | 2035 2040 2045 | |
| | tct gat ggt tac agc cta gca gac aat tcc cag ctt ctc tgc aat | 7186 |
| | Ser Asp Gly Tyr Ser Leu Ala Asp Asn Ser Gln Leu Leu Cys Asn | |
| | 2050 2055 2060 | |
| 35 | gcc cag ggc aag tgg gta ccc cca gaa ggt caa gac atg ccc cgt | 7231 |
| | Ala Gln Gly Lys Trp Val Pro Pro Glu Gly Gln Asp Met Pro Arg | |
| | 2065 2070 2075 | |
| | tgt ata gct cat ttc tgt gaa aaa cct cca teg gtt tcc tat agc | 7276 |
| | Cys Ile Ala His Phe Cys Glu Lys Pro Pro Ser Val Ser Tyr Ser | |
| 40 | 2080 2085 2090 | |
| | atc ttg gaa tct gtg agc aaa gca aaa ttt gca gct gcc tca gtt | 7321 |
| | Ile Leu Glu Ser Val Ser Lys Ala Lys Phe Ala Ala Gly Ser Val | |
| | 2095 2100 2105 | |
| | gtg agc ttt aaa tgc atg gaa ggc ttt gta ctg aac acc tca gca | 7366 |
| 45 | Val Ser Phe Lys Cys Met Glu Gly Phe Val Leu Asn Thr Ser Ala | |
| | 2110 2115 2120 | |
| | aag att gaa tgt atg aga ggt ggg cag tgg aac cct tcc ccc atg | 7411 |
| | Lys Ile Glu Cys Met Arg Gly Gly Gln Trp Asn Pro Ser Pro Met | |
| | 2125 2130 2135 | |

| | | |
|----|---|------|
| 5 | tcc atc cag tgc atc cct gtg cgg tgt gga gag cca cca agc atc | 7456 |
| | Ser Ile Gln Cys Ile Pro Val Arg Cys Gly Glu Pro Pro Ser Ile | |
| | 2140 2145 2150 | |
| | atg aat ggc tat gca agt gga tca aac tac agt ttt gga gcc atg | 7501 |
| | Met Asn Gly Tyr Ala Ser Gly Ser Asn Tyr Ser Phe Gly Ala Met | |
| 10 | 2155 2160 2165 | |
| | gtg gct tac agc tgc aac aag ggg ttc tac atc aaa ggg gaa aag | 7546 |
| | Val Ala Tyr Ser Cys Asn Lys Gly Phe Tyr Ile Lys Gly Glu Lys | |
| | 2170 2175 2180 | |
| | aag agc acc tgc gaa gcc aca ggg cag tgg agt agt cct ata ccg | 7591 |
| 15 | Lys Ser Thr Cys Glu Ala Thr Gly Gln Trp Ser Ser Pro Ile Pro | |
| | 2185 2190 2195 | |
| | acg tgc cac ccg gta tct tgt ggt gaa cca cct aag gtt gag aat | 7636 |
| | Thr Cys His Pro Val Ser Cys Gly Glu Pro Pro Lys Val Glu Asn | |
| | 2200 2205 2210 | |
| 20 | ggc ttt ctg gag cat aca act ggc agg atc ttt gag agt gaa gtg | 7681 |
| | Gly Phe Leu Glu His Thr Thr Gly Arg Ile Phe Glu Ser Glu Val | |
| | 2215 2220 2225 | |
| | agg tat cag tgt aac ccg ggc tat aag tca gtc gga agt cct gta | 7726 |
| | Arg Tyr Gln Cys Asn Pro Gly Tyr Lys Ser Val Gly Ser Pro Val | |
| 25 | 2230 2235 2240 | |
| | ttt gtc tgc caa gcc aat cgc cac tgg cac agt gaa tcc cct ctg | 7771 |
| | Phe Val Cys Gln Ala Asn Arg His Trp His Ser Glu Ser Pro Leu | |
| | 2245 2250 2255 | |
| | atg tgt gtt cct ctc gac tgt gga aaa cct ccc ccg atc cag aat | 7816 |
| 30 | Met Cys Val Pro Leu Asp Cys Gly Lys Pro Pro Pro Ile Gln Asn | |
| | 2260 2265 2270 | |
| | ggc ttc atg aaa gga gaa aac ttt gaa gta ggg tcc aag gtt cag | 7861 |
| | Gly Phe Met Lys Gly Glu Asn Phe Glu Val Gly Ser Lys Val Gln | |
| | 2275 2280 2285 | |
| 35 | ttt ttc tgt aat gag ggt tat gag ctt gtt ggt gac agt tct tgg | 7906 |
| | Phe Phe Cys Asn Glu Gly Tyr Glu Leu Val Gly Asp Ser Ser Trp | |
| | 2290 2295 2300 | |
| | aca tgt cag aaa tct ggc aaa tgg aat aag aag tca aat cca aag | 7951 |
| | Thr Cys Gln Lys Ser Gly Lys Trp Asn Lys Lys Ser Asn Pro Lys | |
| 40 | 2305 2310 2315 | |
| | tgc atg cct gcc aag tgc cca gag ccg ccc ctc ttg gaa aac cag | 7996 |
| | Cys Met Pro Ala Lys Cys Pro Glu Pro Pro Leu Leu Glu Asn Gln | |
| | 2320 2325 2330 | |
| | cta gta tta aag gag ttg acc acc gag gta gga gtt gtg aca ttt | 8041 |
| 45 | Leu Val Leu Lys Glu Leu Thr Thr Glu Val Gly Val Val Thr Phe | |
| | 2335 2340 2345 | |
| | tcc tgt aaa gaa ggg cat gtc ctg caa ggc ccc tct gtc ctg aaa | 8086 |
| | Ser Cys Lys Glu Gly His Val Leu Gln Gly Pro Ser Val Leu Lys | |
| | 2350 2355 2360 | |

| | | |
|----|---|------|
| 5 | tgc ttg cca tcc cag caa tgg aat gac tct ttc cct gtt tgt aag | 8131 |
| | Cys Leu Pro Ser Gln Gln Trp Asn Asp Ser Phe Pro Val Cys Lys | |
| | 2365 2370 2375 | |
| | att gtt ctt tgt acc cca cct ccc cta att tcc ttt ggt gtc ccc | 8176 |
| | Ile Val Leu Cys Thr Pro Pro Pro Leu Ile Ser Phe Gly Val Pro | |
| 10 | 2380 2385 2390 | |
| | att cct tct tct gct ctt cat ttt gga agt act gtc aag tat tct | 8221 |
| | Ile Pro Ser Ser Ala Leu His Phe Gly Ser Thr Val Lys Tyr Ser | |
| | 2395 2400 2405 | |
| | tgt gta ggt ggg ttt ttc cta aga gga aat tct acc acc ctc tgc | 8266 |
| 15 | Cys Val Gly Gly Phe Phe Leu Arg Gly Asn Ser Thr Thr Leu Cys | |
| | 2410 2415 2420 | |
| | caa cct gat ggc acc tgg agc tct cca ctg cca gaa tgt gtt cca | 8311 |
| | Gln Pro Asp Gly Thr Trp Ser Ser Pro Leu Pro Glu Cys Val Pro | |
| | 2425 2430 2435 | |
| 20 | gta gaa tgt ccc caa cct gag gaa atc ccc aat gga atc att gat | 8356 |
| | Val Glu Cys Pro Gln Pro Glu Glu Ile Pro Asn Gly Ile Ile Asp | |
| | 2440 2445 2450 | |
| | gtg caa ggc ctt gcc tat ctc agc aca gct ctc tat acc tgc aag | 8401 |
| | Val Gln Gly Leu Ala Tyr Leu Ser Thr Ala Leu Tyr Thr Cys Lys | |
| 25 | 2455 2460 2465 | |
| | cca ggc ttt gaa ttg gtg gga aat act acc acc ctt tgt gga gaa | 8446 |
| | Pro Gly Phe Glu Leu Val Gly Asn Thr Thr Thr Leu Cys Gly Glu | |
| | 2470 2475 2480 | |
| | aat ggt cac tgg ctt gga gga aaa cca aca tgt aaa gcc att gag | 8491 |
| 30 | Asn Gly His Trp Leu Gly Gly Lys Pro Thr Cys Lys Ala Ile Glu | |
| | 2485 2490 2495 | |
| | tgc ctg aaa ccc aag gag att ttg aat ggc aaa ttc tct tac acg | 8536 |
| | Cys Leu Lys Pro Lys Glu Ile Leu Asn Gly Lys Phe Ser Tyr Thr | |
| | 2500 2505 2510 | |
| 35 | gac cta cac tat gga cag acc gtt acc tac tct tgc aac cga ggc | 8581 |
| | Asp Leu His Tyr Gly Gln Thr Val Thr Tyr Ser Cys Asn Arg Gly | |
| | 2515 2520 2525 | |
| | ttt cgg ctc gaa ggt ccc agt gcc ttg acc tgt tta gag aca ggt | 8626 |
| | Phe Arg Leu Glu Gly Pro Ser Ala Leu Thr Cys Leu Glu Thr Gly | |
| 40 | 2530 2535 2540 | |
| | gat tgg gat gta gat gcc cca tct tgc aat gcc atc cac tgt gat | 8671 |
| | Asp Trp Asp Val Asp Ala Pro Ser Cys Asn Ala Ile His Cys Asp | |
| | 2545 2550 2555 | |
| | tcc cca caa ccc att gaa aat ggt ttt gta gaa ggt gca gat tac | 8716 |
| 45 | Ser Pro Gln Pro Ile Glu Asn Gly Phe Val Glu Gly Ala Asp Tyr | |
| | 2560 2565 2570 | |
| | agc tat ggt gcc ata atc atc tac agt tgc ttc cct ggg ttt cag | 8761 |
| | Ser Tyr Gly Ala Ile Ile Ile Tyr Ser Cys Phe Pro Gly Phe Gln | |
| | 2575 2580 2585 | |

| | | |
|----|---|------|
| 5 | gtg gct ggt cat gcc atg cag acc tgt gaa gag tca gga tgg tca | 8806 |
| | Val Ala Gly His Ala Met Gln Thr Cys Glu Glu Ser Gly Trp Ser | |
| | 2590 2595 2600 | |
| | agt tcc atc cca aca tgt atg cca ata gac tgt ggc ctc cct cct | 8851 |
| | Ser Ser Ile Pro Thr Cys Met Pro Ile Asp Cys Gly Leu Pro Pro | |
| 10 | 2605 2610 2615 | |
| | cat ata gat ttt gga gac tgt act aaa ctc aaa gat gac cag gga | 8896 |
| | His Ile Asp Phe Gly Asp Cys Thr Lys Leu Lys Asp Asp Gln Gly | |
| | 2620 2625 2630 | |
| | tat ttt gag caa gaa gac gac atg atg gaa gtt cca tat gtg act | 8941 |
| 15 | Tyr Phe Glu Gln Glu Asp Asp Met Met Glu Val Pro Tyr Val Thr | |
| | 2635 2640 2645 | |
| | cct cac cct cct tat cat ttg gga gca gtg gct aaa acc tgg gaa | 8986 |
| | Pro His Pro Pro Tyr His Leu Gly Ala Val Ala Lys Thr Trp Glu | |
| | 2650 2655 2660 | |
| 20 | aat aca aag gag tct cct gct aca cat tca tca aac ttt ctg tat | 9031 |
| | Asn Thr Lys Glu Ser Pro Ala Thr His Ser Ser Asn Phe Leu Tyr | |
| | 2665 2670 2675 | |
| | ggt acc atg gtt tca tac acc tgt aat cca gga tat gaa ctt ctg | 9076 |
| | Gly Thr Met Val Ser Tyr Thr Cys Asn Pro Gly Tyr Glu Leu Leu | |
| 25 | 2680 2685 2690 | |
| | ggg aac cct gtg ctg atc tgc cag gaa gat gga act tgg aat ggc | 9121 |
| | Gly Asn Pro Val Leu Ile Cys Gln Glu Asp Gly Thr Trp Asn Gly | |
| | 2695 2700 2705 | |
| | agt gca cca tcc tgc att tca att gaa tgt gac ttg cct act gct | 9166 |
| 30 | Ser Ala Pro Ser Cys Ile Ser Ile Glu Cys Asp Leu Pro Thr Ala | |
| | 2710 2715 2720 | |
| | cct gaa aat ggc ttt ttg cgt ttt aca gag act agc atg gga agt | 9211 |
| | Pro Glu Asn Gly Phe Leu Arg Phe Thr Glu Thr Ser Met Gly Ser | |
| | 2725 2730 2735 | |
| 35 | gct gtg cag tat agc tgt aaa cct gga cac att cta gca ggc tct | 9256 |
| | Ala Val Gln Tyr Ser Cys Lys Pro Gly His Ile Leu Ala Gly Ser | |
| | 2740 2745 2750 | |
| | gac tta agg ctt tgt cta gag aat aga aag tgg agt ggt gcc tcc | 9301 |
| | Asp Leu Arg Leu Cys Leu Glu Asn Arg Lys Trp Ser Gly Ala Ser | |
| 40 | 2755 2760 2765 | |
| | cca cgc tgt gaa gcc att tca tgc aaa aag cca aat cca gtc atg | 9346 |
| | Pro Arg Cys Glu Ala Ile Ser Cys Lys Lys Pro Asn Pro Val Met | |
| | 2770 2775 2780 | |
| | aat gga tcc atc aaa gga agc aac tac aca tac ctg agc acg ttg | 9391 |
| 45 | Asn Gly Ser Ile Lys Gly Ser Asn Tyr Thr Tyr Leu Ser Thr Leu | |
| | 2785 2790 2795 | |
| | tac tat gag tgt gac ccc gga tat gtg ctg aat ggc act gag agg | 9436 |
| | Tyr Tyr Glu Cys Asp Pro Gly Tyr Val Leu Asn Gly Thr Glu Arg | |
| | 2800 2805 2810 | |

| | | |
|----|---|-------|
| 5 | aga aca tgc cag gat gac aaa aac tgg gat gag gat gag ccc att | 9481 |
| | Arg Thr Cys Gln Asp Asp Lys Asn Trp Asp Glu Asp Glu Pro Ile | |
| | 2815 2820 2825 | |
| | tgc att cct gtg gac tgc agt tca ccc cca gtc tca gcc aat ggc | 9526 |
| | Cys Ile Pro Val Asp Cys Ser Ser Pro Pro Val Ser Ala Asn Gly | |
| 10 | 2830 2835 2840 | |
| | cag gtg aga gga gac gag tac aca ttc caa aaa gag att gaa tac | 9571 |
| | Gln Val Arg Gly Asp Glu Tyr Thr Phe Gln Lys Glu Ile Glu Tyr | |
| | 2845 2850 2855 | |
| | act tgc aat gaa ggg ttc ttg ctt gag gga gcc agg agt cgg gtt | 9616 |
| 15 | Thr Cys Asn Glu Gly Phe Leu Leu Glu Gly Ala Arg Ser Arg Val | |
| | 2860 2865 2870 | |
| | tgt ctt gcc aat gga agt tgg agt gga gcc act ccc gac tgt gtg | 9661 |
| | Cys Leu Ala Asn Gly Ser Trp Ser Gly Ala Thr Pro Asp Cys Val | |
| | 2875 2880 2885 | |
| 20 | cct gtc aga tgt gcc acc ccg cca caa ctg gcc aat ggg gtg acg | 9706 |
| | Pro Val Arg Cys Ala Thr Pro Pro Gln Leu Ala Asn Gly Val Thr | |
| | 2890 2895 2900 | |
| | gaa ggc ctg gac tat ggc ttc atg aag gaa gta aca ttc cac tgt | 9751 |
| | Glu Gly Leu Asp Tyr Gly Phe Met Lys Glu Val Thr Phe His Cys | |
| 25 | 2905 2910 2915 | |
| | cac gag ggc tac atc ttg cac ggt gct cca aaa ctc acc tgt cag | 9796 |
| | His Glu Gly Tyr Ile Leu His Gly Ala Pro Lys Leu Thr Cys Gln | |
| | 2920 2925 2930 | |
| | tca gat ggc aac tgg gat gca gag att cct ctc tgt aaa cca gtc | 9841 |
| 30 | Ser Asp Gly Asn Trp Asp Ala Glu Ile Pro Leu Cys Lys Pro Val | |
| | 2935 2940 2945 | |
| | aac tgt gga cct cct gaa gat ctt gcc cat ggt ttc cct aat ggt | 9886 |
| | Asn Cys Gly Pro Pro Glu Asp Leu Ala His Gly Phe Pro Asn Gly | |
| | 2950 2955 2960 | |
| 35 | ttt tcc ttt att cat ggg ggc cat ata cag tat cag tgc ttt cct | 9931 |
| | Phe Ser Phe Ile His Gly Gly His Ile Gln Tyr Gln Cys Phe Pro | |
| | 2965 2970 2975 | |
| | ggt tat aag ctc cat gga aat tca tca aga agg tgc ctc tcc aat | 9976 |
| | Gly Tyr Lys Leu His Gly Asn Ser Ser Arg Arg Cys Leu Ser Asn | |
| 40 | 2980 2985 2990 | |
| | ggc tcc tgg agt ggc agc tca cct tcc tgc ctg cct tgc aga tgt | 10021 |
| | Gly Ser Trp Ser Gly Ser Ser Pro Ser Cys Leu Pro Cys Arg Cys | |
| | 2995 3000 3005 | |
| | tcc aca cca gta att gaa tat gga act gtc aat ggg aca gat ttt | 10066 |
| 45 | Ser Thr Pro Val Ile Glu Tyr Gly Thr Val Asn Gly Thr Asp Phe | |
| | 3010 3015 3020 | |
| | gac tgt gga aag gca gcc cgg att cag tgc ttc aaa ggc ttc aag | 10111 |
| | Asp Cys Gly Lys Ala Ala Arg Ile Gln Cys Phe Lys Gly Phe Lys | |
| | 3025 3030 3035 | |

| | | |
|----|---|-------|
| 5 | ctc cta gga ctt tct gaa atc acc tgt gaa gcc gat ggc cag tgg | 10156 |
| | Leu Leu Gly Leu Ser Glu Ile Thr Cys Glu Ala Asp Gly Gln Trp | |
| | 3040 3045 3050 | |
| | agc tct ggg ttc ccc cac tgt gaa cac act tct tgt ggt tct ctt | 10201 |
| | Ser Ser Gly Phe Pro His Cys Glu His Thr Ser Cys Gly Ser Leu | |
| 10 | 3055 3060 3065 | |
| | cca atg ata cca aat gcg ttc atc agt gag acc agc tct tgg aag | 10246 |
| | Pro Met Ile Pro Asn Ala Phe Ile Ser Glu Thr Ser Ser Trp Lys | |
| | 3070 3075 3080 | |
| | gaa aat gtg ata act tac agc tgc agg tct gga tat gtc ata caa | 10291 |
| 15 | Glu Asn Val Ile Thr Tyr Ser Cys Arg Ser Gly Tyr Val Ile Gln | |
| | 3085 3090 3095 | |
| | ggc agt tca gat ctg att tgt aca gag aaa ggg gta tgg agc cag | 10336 |
| | Gly Ser Ser Asp Leu Ile Cys Thr Glu Lys Gly Val Trp Ser Gln | |
| | 3100 3105 3110 | |
| 20 | cct tat cca gtc tgt gag ccc ttg tcc tgt ggg tcc cca ccg tct | 10381 |
| | Pro Tyr Pro Val Cys Glu Pro Leu Ser Cys Gly Ser Pro Pro Ser | |
| | 3115 3120 3125 | |
| | gtc gcc aat gca gtg gca act gga gag gca cac acc tat gaa agt | 10426 |
| | Val Ala Asn Ala Val Ala Thr Gly Glu Ala His Thr Tyr Glu Ser | |
| 25 | 3130 3135 3140 | |
| | gaa gtg aaa ctc aga tgt ctg gaa ggt tat acg atg gat aca gat | 10471 |
| | Glu Val Lys Leu Arg Cys Leu Glu Gly Tyr Thr Met Asp Thr Asp | |
| | 3145 3150 3155 | |
| | aca gat aca ttc acc tgt cag aaa gat ggt cgc tgg ttc cct gag | 10516 |
| 30 | Thr Asp Thr Phe Thr Cys Gln Lys Asp Gly Arg Trp Phe Pro Glu | |
| | 3160 3165 3170 | |
| | aga atc tcc tgc agt cct aaa aaa tgt cct ctc ccg gaa aac ata | 10561 |
| | Arg Ile Ser Cys Ser Pro Lys Lys Cys Pro Leu Pro Glu Asn Ile | |
| | 3175 3180 3185 | |
| 35 | aca cat ata ctt gta cat ggg gac gat ttc agt gtg aat agg caa | 10606 |
| | Thr His Ile Leu Val His Gly Asp Asp Phe Ser Val Asn Arg Gln | |
| | 3190 3195 3200 | |
| | gtt tct gtg tca tgt gca gaa ggg tat acc ttt gag gga gtt aac | 10651 |
| | Val Ser Val Ser Cys Ala Glu Gly Tyr Thr Phe Glu Gly Val Asn | |
| 40 | 3205 3210 3215 | |
| | ata tca gta tgt cag ctt gat gga acc tgg gag cca cca ttc tcc | 10696 |
| | Ile Ser Val Cys Gln Leu Asp Gly Thr Trp Glu Pro Pro Phe Ser | |
| | 3220 3225 3230 | |
| | gat gaa tct tgc agt cca gtt tct tgt ggg aaa cct gaa agt cca | 10741 |
| 45 | Asp Glu Ser Cys Ser Pro Val Ser Cys Gly Lys Pro Glu Ser Pro | |
| | 3235 3240 3245 | |
| | gaa cat gga ttt gtg gtt ggc agt aaa tac acc ttt gaa agc aca | 10786 |
| | Glu His Gly Phe Val Val Gly Ser Lys Tyr Thr Phe Glu Ser Thr | |
| | 3250 3255 3260 | |

| | | | | | |
|----|-------------|---------------------|---------------------|---------|-------|
| 5 | att att tat | cag tgt gag cct ggc | tat gaa cta gag ggg | aac agg | 10831 |
| | Ile Ile Tyr | Gln Cys Glu Pro Gly | Tyr Glu Leu Glu Gly | Asn Arg | |
| | 3265 | 3270 | 3275 | | |
| | gaa cgt gtc | tgc cag gag aac aga | cag tgg agt gga ggg | gtg gca | 10876 |
| | Glu Arg Val | Cys Gln Glu Asn Arg | Gln Trp Ser Gly Gly | Val Ala | |
| 10 | 3280 | 3285 | 3290 | | |
| | ata tgc aaa | gag acc agg tgt gaa | act cca ctt gaa ttt | ctc aat | 10921 |
| | Ile Cys Lys | Glu Thr Arg Cys Glu | Thr Pro Leu Glu Phe | Leu Asn | |
| | 3295 | 3300 | 3305 | | |
| | ggg aaa gct | gac att gaa aac agg | acg act gga ccc aac | gtg gta | 10966 |
| 15 | Gly Lys Ala | Asp Ile Glu Asn Arg | Thr Thr Gly Pro Asn | Val Val | |
| | 3310 | 3315 | 3320 | | |
| | tat tcc tgc | aac aga ggc tac agt | ctt gaa ggg cca tct | gag gca | 11011 |
| | Tyr Ser Cys | Asn Arg Gly Tyr Ser | Leu Glu Gly Pro Ser | Glu Ala | |
| | 3325 | 3330 | 3335 | | |
| 20 | cac tgc aca | gaa aat gga acc tgg | agc cac cca gtc cct | ctc tgc | 11056 |
| | His Cys Thr | Glu Asn Gly Thr Trp | Ser His Pro Val Pro | Leu Cys | |
| | 3340 | 3345 | 3350 | | |
| | aaa cca aat | cca tgc cct gtt cct | ttt gtg att ccc gag | aat gct | 11101 |
| | Lys Pro Asn | Pro Cys Pro Val Pro | Phe Val Ile Pro Glu | Asn Ala | |
| 25 | 3355 | 3360 | 3365 | | |
| | ctg ctg tct | gaa aag gag ttt tat | gtt gat cag aat gtg | tcc atc | 11146 |
| | Leu Leu Ser | Glu Lys Glu Phe Tyr | Val Asp Gln Asn Val | Ser Ile | |
| | 3370 | 3375 | 3380 | | |
| | aaa tgt agg | gaa ggt ttt ctg ctg | cag ggc cac ggc atc | att acc | 11191 |
| 30 | Lys Cys Arg | Glu Gly Phe Leu Leu | Gln Gly His Gly Ile | Ile Thr | |
| | 3385 | 3390 | 3395 | | |
| | tgc aac ccc | gac gag acg tgg aca | cag aca agc gcc aaa | tgt gaa | 11236 |
| | Cys Asn Pro | Asp Glu Thr Trp Thr | Gln Thr Ser Ala Lys | Cys Glu | |
| | 3400 | 3405 | 3410 | | |
| 35 | aaa atc tca | tgt ggt cca cca gct | cac gta gaa aat gca | att gct | 11281 |
| | Lys Ile Ser | Cys Gly Pro Pro Ala | His Val Glu Asn Ala | Ile Ala | |
| | 3415 | 3420 | 3425 | | |
| | cga ggc gta | cat tat caa tat gga | gac atg atc acc tac | tca tgt | 11326 |
| | Arg Gly Val | His Tyr Gln Tyr Gly | Asp Met Ile Thr Tyr | Ser Cys | |
| 40 | 3430 | 3435 | 3440 | | |
| | tac agt gga | tac atg ttg gag ggt | ttc ctg agg agt gtt | tgt tta | 11371 |
| | Tyr Ser Gly | Tyr Met Leu Glu Gly | Phe Leu Arg Ser Val | Cys Leu | |
| | 3445 | 3450 | 3455 | | |
| | gaa aat gga | aca tgg aca tca cct | cct att tgc aga gct | gtc tgt | 11416 |
| 45 | Glu Asn Gly | Thr Trp Thr Ser Pro | Pro Ile Cys Arg Ala | Val Cys | |
| | 3460 | 3465 | 3470 | | |
| | cga ttt cca | tgt cag aat ggg ggc | atc tgc caa cgc cca | aat gct | 11461 |
| | Arg Phe Pro | Cys Gln Asn Gly Gly | Ile Cys Gln Arg Pro | Asn Ala | |
| | 3475 | 3480 | 3485 | | |

5 tgt tcc tgt cca gag ggc tgg atg ggg cgc ctc tgt gaa gaa cca 11506
 Cys Ser Cys Pro Glu Gly Trp Met Gly Arg Leu Cys Glu Glu Pro
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 Tyr Gln Cys Asp Cys Pro Pro Gly Trp Thr Gly Ser Arg Cys His
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 15 Thr Ala Val Cys Gln Ser Pro Cys Leu Asn Gly Gly Lys Cys Val
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 Arg Leu Phe Pro Glu Thr Ala Pro Gly Ala Pro Gly Ser Ile Pro Ala
 35 40 45

40 Pro Pro Ala Pro Gly Asp Glu Ala Ala Gly Ser Arg Val Glu Arg Leu
 50 55 60
 Gly Gln Ala Phe Arg Arg Val Arg Leu Leu Arg Glu Leu Ser Glu
 65 70 75 80
 Arg Leu Glu Leu Val Phe Leu Val Asp Asp Ser Ser Ser Val Gly Glu
 85 90 95

45 Val Asn Phe Arg Ser Glu Leu Met Phe Val Arg Lys Leu Leu Ser Asp
 100 105 110
 Phe Pro Val Val Pro Thr Ala Thr Arg Val Ala Ile Val Thr Phe Ser
 115 120 125

5 Ser Lys Asn Tyr Val Val Pro Arg Val Asp Tyr Ile Ser Thr Arg Arg
 130 - 135 140
 Ala Arg Gln His Lys Cys Ala Leu Leu Leu Gln Glu Ile Pro Ala Ile
 145 150 155 160
 Ser Tyr Arg Gly Gly Gly Thr Tyr Thr Lys Gly Ala Phe Gln Gln Ala
 10 165 170 175
 Ala Gln Ile Leu Leu His Ala Arg Glu Asn Ser Thr Lys Val Val Phe
 180 185 190
 Leu Ile Thr Asp Gly Tyr Ser Asn Gly Gly Asp Pro Arg Pro Ile Ala
 195 200 205
 15 Ala Ser Leu Arg Asp Ser Gly Val Glu Ile Phe Thr Phe Gly Ile Trp
 210 215 220
 Gln Gly Asn Ile Arg Glu Leu Asn Asp Met Ala Ser Thr Pro Lys Glu
 225 230 235 240
 Glu His Cys Tyr Leu Leu His Ser Phe Glu Glu Phe Glu Ala Leu Ala
 20 245 250 255
 Arg Arg Ala Leu His Glu Asp Leu Pro Ser Gly Ser Phe Ile Gln Asp
 260 265 270
 Asp Met Val His Cys Ser Tyr Leu Cys Asp Glu Gly Lys Asp Cys Cys
 275 280 285
 25 Asp Arg Met Gly Ser Cys Lys Cys Gly Thr His Thr Gly His Phe Glu
 290 295 300
 Cys Ile Cys Glu Lys Gly Tyr Tyr Gly Lys Gly Leu Gln Tyr Glu Cys
 305 310 315 320
 Thr Ala Cys Pro Ser Gly Thr Tyr Lys Pro Glu Gly Ser Pro Gly Gly
 30 325 330 335
 Ile Ser Ser Cys Ile Pro Cys Pro Asp Glu Asn His Thr Ser Pro Pro
 340 345 350
 Gly Ser Thr Ser Pro Glu Asp Cys Val Cys Arg Glu Gly Tyr Arg Ala
 355 360 365
 35 Ser Gly Gln Thr Cys Glu Leu Val His Cys Pro Ala Leu Lys Pro Pro
 370 375 380
 Glu Asn Gly Tyr Phe Ile Gln Asn Thr Cys Asn Asn His Phe Asn Ala
 385 390 395 400
 Ala Cys Gly Val Arg Cys His Pro Gly Phe Asp Leu Val Gly Ser Ser
 40 405 410 415
 Ile Ile Leu Cys Leu Pro Asn Gly Leu Trp Ser Gly Ser Glu Ser Tyr
 420 425 430
 Cys Arg Val Arg Thr Cys Pro His Leu Arg Gln Pro Lys His Gly His
 435 440 445
 45 Ile Ser Cys Ser Thr Arg Glu Met Leu Tyr Lys Thr Thr Cys Leu Val
 450 455 460
 Ala Cys Asp Glu Gly Tyr Arg Leu Glu Gly Ser Asp Lys Leu Thr Cys
 465 470 475 480
 Gln Gly Asn Ser Gln Trp Asp Gly Pro Glu Pro Arg Cys Val Glu Arg

5 485 490 495
 His Cys Ser Thr Phe Gln Met Pro Lys Asp Val Ile Ile Ser Pro His
 500 505 510
 Asn Cys Gly Lys Gln Pro Ala Lys Phe Gly Thr Ile Cys Tyr Val Ser
 515 520 525
 10 Cys Arg Gln Gly Phe Ile Leu Ser Gly Val Lys Glu Met Leu Arg Cys
 530 535 540
 Thr Thr Ser Gly Lys Trp Asn Val Gly Val Gln Ala Ala Val Cys Lys
 545 550 555 560
 Asp Val Glu Ala Pro Gln Ile Asn Cys Pro Lys Asp Ile Glu Ala Lys
 15 565 570 575
 Thr Leu Glu Gln Gln Asp Ser Ala Asn Val Thr Trp Gln Ile Pro Thr
 580 585 590
 Ala Lys Asp Asn Ser Gly Glu Lys Val Ser Val His Val His Pro Ala
 595 600 605
 20 Phe Thr Pro Pro Tyr Leu Phe Pro Ile Gly Asp Val Ala Ile Val Tyr
 610 615 620
 Thr Ala Thr Asp Leu Ser Gly Asn Gln Ala Ser Cys Ile Phe His Ile
 625 630 635 640
 Lys Val Ile Asp Ala Glu Pro Pro Val Ile Asp Trp Cys Arg Ser Pro
 25 645 650 655
 Pro Pro Val Gln Val Ser Glu Lys Val His Ala Ala Ser Trp Asp Glu
 660 665 670
 Pro Gln Phe Ser Asp Asn Ser Gly Ala Glu Leu Val Ile Thr Arg Ser
 675 680 685
 30 His Thr Gln Gly Asp Leu Phe Pro Gln Gly Glu Thr Ile Val Gln Tyr
 690 695 700
 Thr Ala Thr Asp Pro Ser Gly Asn Asn Arg Thr Cys Asp Ile His Ile
 705 710 715 720
 Val Ile Lys Gly Ser Pro Cys Glu Ile Pro Phe Thr Pro Val Asn Gly
 35 725 730 735
 Asp Phe Ile Cys Thr Pro Asp Asn Thr Gly Val Asn Cys Thr Leu Thr
 740 745 750
 Cys Leu Glu Gly Tyr Asp Phe Thr Glu Gly Ser Thr Asp Lys Tyr Tyr
 755 760 765
 40 Cys Ala Tyr Glu Asp Gly Val Trp Lys Pro Thr Tyr Thr Thr Glu Trp
 770 775 780
 Pro Asp Cys Ala Lys Lys Arg Phe Ala Asn His Gly Phe Lys Ser Phe
 785 790 795 800
 Glu Met Phe Tyr Lys Ala Ala Arg Cys Asp Asp Thr Asp Leu Met Lys
 45 805 810 815
 Lys Phe Ser Glu Ala Phe Glu Thr Thr Leu Gly Lys Met Val Pro Ser
 820 825 830
 Phe Cys Ser Asp Ala Glu Asp Ile Asp Cys Arg Leu Glu Glu Asn Leu
 835 840 845

5 Thr Lys Lys Tyr Cys Leu Glu Tyr Asn Tyr Asp Tyr Glu Asn Gly Phe
 850 - 855 860
 Ala Ile Gly Pro Gly Gly Trp Gly Ala Ala Asn Arg Leu Asp Tyr Ser
 865 870 875 880
 Tyr Asp Asp Phe Leu Asp Thr Val Gln Glu Thr Ala Thr Ser Ile Gly
 10 885 890 895
 Asn Ala Lys Ser Ser Arg Ile Lys Arg Ser Ala Pro Leu Ser Asp Tyr
 900 905 910
 Lys Ile Lys Leu Ile Phe Asn Ile Thr Ala Ser Val Pro Leu Pro Asp
 915 920 925
 15 Glu Arg Asn Asp Thr Leu Glu Trp Glu Asn Gln Gln Arg Leu Leu Gln
 930 935 940
 Thr Leu Glu Thr Ile Thr Asn Lys Leu Lys Arg Thr Leu Asn Lys Asp
 945 950 955 960
 Pro Met Tyr Ser Phe Gln Leu Ala Ser Glu Ile Leu Ile Ala Asp Ser
 20 965 970 975
 Asn Ser Leu Glu Thr Lys Lys Ala Ser Pro Phe Cys Arg Pro Gly Ser
 980 985 990
 Val Leu Arg Gly Arg Met Cys Val Asn Cys Pro Leu Gly Thr Tyr Tyr
 995 1000 1005
 25 Asn Leu Glu His Phe Thr Cys Glu Ser Cys Arg Ile Gly Ser Tyr
 1010 1015 1020
 Gln Asp Glu Glu Gly Gln Leu Glu Cys Lys Leu Cys Pro Ser Gly
 1025 1030 1035
 Met Tyr Thr Glu Tyr Ile His Ser Arg Asn Ile Ser Asp Cys Lys
 30 1040 1045 1050
 Ala Gln Cys Lys Gln Gly Thr Tyr Ser Tyr Ser Gly Leu Glu Thr
 1055 1060 1065
 Cys Glu Ser Cys Pro Leu Gly Thr Tyr Gln Pro Lys Phe Gly Ser
 1070 1075 1080
 35 Arg Ser Cys Leu Ser Cys Pro Glu Asn Thr Ser Thr Val Lys Arg
 1085 1090 1095
 Gly Ala Val Asn Ile Ser Ala Cys Gly Val Pro Cys Pro Glu Gly
 1100 1105 1110
 Lys Phe Ser Arg Ser Gly Leu Met Pro Cys His Pro Cys Pro Arg
 40 1115 1120 1125
 Asp Tyr Tyr Gln Pro Asn Ala Gly Lys Ala Phe Cys Leu Ala Cys
 1130 1135 1140
 Pro Phe Tyr Gly Thr Thr Pro Phe Ala Gly Ser Arg Ser Ile Thr
 1145 1150 1155
 45 Glu Cys Ser Ser Phe Ser Ser Thr Phe Ser Ala Ala Glu Glu Ser
 1160 1165 1170
 Val Val Pro Pro Ala Ser Leu Gly His Ile Lys Lys Arg His Glu
 1175 1180 1185
 Ile Ser Ser Gln Val Phe His Glu Cys Phe Phe Asn Pro Cys His

| | | | | | | | | | | | | |
|----|---------|---------|---------|-----|--|---------|---------|-----|-----|-----|-----|------|
| 5 | 1190 | | | | | 1195 | | | | | | 1200 |
| | Asn Ser | Gly Thr | Cys Gln | Gln | | Leu Gly | Arg Gly | Tyr | Val | Cys | Leu | |
| | 1205 | | | | | 1210 | | | | | | 1215 |
| | Cys Pro | Leu Gly | Tyr Thr | Gly | | Leu Lys | Cys Glu | Thr | Asp | Ile | Asp | |
| | 1220 | | | | | 1225 | | | | | | 1230 |
| 10 | Glu Cys | Ser Pro | Leu Pro | Cys | | Leu Asn | Asn Gly | Val | Cys | Lys | Asp | |
| | 1235 | | | | | 1240 | | | | | | 1245 |
| | Leu Val | Gly Glu | Phe Ile | Cys | | Glu Cys | Pro Ser | Gly | Tyr | Thr | Gly | |
| | 1250 | | | | | 1255 | | | | | | 1260 |
| 15 | Gln Arg | Cys Glu | Glu Asn | Ile | | Asn Glu | Cys Ser | Ser | Ser | Pro | Cys | |
| | 1265 | | | | | 1270 | | | | | | 1275 |
| | Leu Asn | Lys Gly | Ile Cys | Val | | Asp Gly | Val Ala | Gly | Tyr | Arg | Cys | |
| | 1280 | | | | | 1285 | | | | | | 1290 |
| | Thr Cys | Val Lys | Gly Phe | Val | | Gly Leu | His Cys | Glu | Thr | Glu | Val | |
| | 1295 | | | | | 1300 | | | | | | 1305 |
| 20 | Asn Glu | Cys Gln | Ser Asn | Pro | | Cys Leu | Asn Asn | Ala | Val | Cys | Glu | |
| | 1310 | | | | | 1315 | | | | | | 1320 |
| | Asp Gln | Val Gly | Gly Phe | Leu | | Cys Lys | Cys Pro | Pro | Gly | Phe | Leu | |
| | 1325 | | | | | 1330 | | | | | | 1335 |
| 25 | Gly Thr | Arg Cys | Gly Lys | Asn | | Val Asp | Glu Cys | Leu | Ser | Gln | Pro | |
| | 1340 | | | | | 1345 | | | | | | 1350 |
| | Cys Lys | Asn Gly | Ala Thr | Cys | | Lys Asp | Gly Ala | Asn | Ser | Phe | Arg | |
| | 1355 | | | | | 1360 | | | | | | 1365 |
| | Cys Leu | Cys Ala | Ala Gly | Phe | | Thr Gly | Ser His | Cys | Glu | Leu | Asn | |
| | 1370 | | | | | 1375 | | | | | | 1380 |
| 30 | Ile Asn | Glu Cys | Gln Ser | Asn | | Pro Cys | Arg Asn | Gln | Ala | Thr | Cys | |
| | 1385 | | | | | 1390 | | | | | | 1395 |
| | Val Asp | Glu Leu | Asn Ser | Tyr | | Ser Cys | Lys Cys | Gln | Pro | Gly | Phe | |
| | 1400 | | | | | 1405 | | | | | | 1410 |
| 35 | Ser Gly | Lys Arg | Cys Glu | Thr | | Glu Gln | Ser Thr | Gly | Phe | Asn | Leu | |
| | 1415 | | | | | 1420 | | | | | | 1425 |
| | Asp Phe | Glu Val | Ser Gly | Ile | | Tyr Gly | Tyr Val | Met | Leu | Asp | Gly | |
| | 1430 | | | | | 1435 | | | | | | 1440 |
| | Met Leu | Pro Ser | Leu His | Ala | | Leu Thr | Cys Thr | Phe | Trp | Met | Lys | |
| | 1445 | | | | | 1450 | | | | | | 1455 |
| 40 | Ser Ser | Asp Asp | Met Asn | Tyr | | Gly Thr | Pro Ile | Ser | Tyr | Ala | Val | |
| | 1460 | | | | | 1465 | | | | | | 1470 |
| | Asp Asn | Gly Ser | Asp Asn | Thr | | Leu Leu | Leu Thr | Asp | Tyr | Asn | Gly | |
| | 1475 | | | | | 1480 | | | | | | 1485 |
| 45 | Trp Val | Leu Tyr | Val Asn | Gly | | Arg Glu | Lys Ile | Thr | Asn | Cys | Pro | |
| | 1490 | | | | | 1495 | | | | | | 1500 |
| | Ser Val | Asn Asp | Gly Arg | Trp | | His His | Ile Ala | Ile | Thr | Trp | Thr | |
| | 1505 | | | | | 1510 | | | | | | 1515 |
| | Ser Ala | Asn Gly | Ile Trp | Lys | | Val Tyr | Ile Asp | Gly | Lys | Leu | Ser | |
| | 1520 | | | | | 1525 | | | | | | 1530 |

5 Asp Gly Gly Ala Gly Leu Ser Val Gly Leu Pro Ile Pro Gly Gly
 1535- 1540 1545
 Gly Ala Leu Val Leu Gly Gln Glu Gln Asp Lys Lys Gly Glu Gly
 1550 1555 1560
 Phe Ser Pro Ala Glu Ser Phe Val Gly Ser Ile Ser Gln Leu Asn
 10 1565 1570 1575
 Leu Trp Asp Tyr Val Leu Ser Pro Gln Gln Val Lys Ser Leu Ala
 1580 1585 1590
 Thr Ser Cys Pro Glu Glu Leu Ser Lys Gly Asn Val Leu Ala Trp
 1595 1600 1605
 15 Pro Asp Phe Leu Ser Gly Ile Val Gly Lys Val Lys Ile Asp Ser
 1610 1615 1620
 Lys Ser Ile Phe Cys Ser Asp Cys Pro Arg Leu Gly Gly Ser Val
 1625 1630 1635
 Pro His Leu Arg Thr Ala Ser Glu Asp Leu Lys Pro Gly Ser Lys
 20 1640 1645 1650
 Val Asn Leu Phe Cys Asp Pro Gly Phe Gln Leu Val Gly Asn Pro
 1655 1660 1665
 Val Gln Tyr Cys Leu Asn Gln Gly Gln Trp Thr Gln Pro Leu Pro
 1670 1675 1680
 25 His Cys Glu Arg Ile Ser Cys Gly Val Pro Pro Pro Leu Glu Asn
 1685 1690 1695
 Gly Phe His Ser Ala Asp Asp Phe Tyr Ala Gly Ser Thr Val Thr
 1700 1705 1710
 Tyr Gln Cys Asn Asn Gly Tyr Tyr Leu Leu Gly Asp Ser Arg Met
 30 1715 1720 1725
 Phe Cys Thr Asp Asn Gly Ser Trp Asn Gly Val Ser Pro Ser Cys
 1730 1735 1740
 Leu Asp Val Asp Glu Cys Ala Val Gly Ser Asp Cys Ser Glu His
 1745 1750 1755
 35 Ala Ser Cys Leu Asn Val Asp Gly Ser Tyr Ile Cys Ser Cys Val
 1760 1765 1770
 Pro Pro Tyr Thr Gly Asp Gly Lys Asn Cys Ala Glu Pro Ile Lys
 1775 1780 1785
 Cys Lys Ala Pro Gly Asn Pro Glu Asn Gly His Ser Ser Gly Glu
 40 1790 1795 1800
 Ile Tyr Thr Val Gly Ala Ala Val Thr Phe Ser Cys Gln Glu Gly
 1805 1810 1815
 Tyr Gln Leu Met Gly Val Thr Lys Ile Thr Cys Leu Glu Ser Gly
 1820 1825 1830
 45 Glu Trp Asn His Leu Ile Pro Tyr Cys Lys Ala Val Ser Cys Gly
 1835 1840 1845
 Lys Pro Ala Ile Pro Glu Asn Gly Cys Ile Glu Glu Leu Ala Phe
 1850 1855 1860
 Thr Phe Gly Ser Lys Val Thr Tyr Arg Cys Asn Lys Gly Tyr Thr

| | | | | | | | | | |
|----|---------|---------------------|---------------------|-------------|------|--|--|--|--|
| 5 | 1865 | | 1870 | | 1875 | | | | |
| | Leu Ala | Gly Asp Lys Glu Ser | Ser Cys Leu Ala Asn | Ser Ser Trp | | | | | |
| | 1880 | | 1885 | | 1890 | | | | |
| | Ser His | Ser Pro Pro Val Cys | Glu Pro Val Lys Cys | Ser Ser Pro | | | | | |
| | 1895 | | 1900 | | 1905 | | | | |
| 10 | Glu Asn | Ile Asn Asn Gly Lys | Tyr Ile Leu Ser Gly | Leu Thr Tyr | | | | | |
| | 1910 | | 1915 | | 1920 | | | | |
| | Leu Ser | Thr Ala Ser Tyr Ser | Cys Asp Thr Gly Tyr | Ser Leu Gln | | | | | |
| | 1925 | | 1930 | | 1935 | | | | |
| | Gly Pro | Ser Ile Ile Glu Cys | Thr Ala Ser Gly Ile | Trp Asp Arg | | | | | |
| 15 | 1940 | | 1945 | | 1950 | | | | |
| | Ala Pro | Pro Ala Cys His Leu | Val Phe Cys Gly Glu | Pro Pro Ala | | | | | |
| | 1955 | | 1960 | | 1965 | | | | |
| | Ile Lys | Asp Ala Val Ile Thr | Gly Asn Asn Phe Thr | Phe Arg Asn | | | | | |
| | 1970 | | 1975 | | 1980 | | | | |
| 20 | Thr Val | Thr Tyr Thr Cys Lys | Glu Gly Tyr Thr Leu | Ala Gly Leu | | | | | |
| | 1985 | | 1990 | | 1995 | | | | |
| | Asp Thr | Ile Glu Cys Leu Ala | Asp Gly Lys Trp Ser | Arg Ser Asp | | | | | |
| | 2000 | | 2005 | | 2010 | | | | |
| | Gln Gln | Cys Leu Ala Val Ser | Cys Asp Glu Pro Pro | Ile Val Asp | | | | | |
| 25 | 2015 | | 2020 | | 2025 | | | | |
| | His Ala | Ser Pro Glu Thr Ala | His Arg Leu Phe Gly | Asp Ile Ala | | | | | |
| | 2030 | | 2035 | | 2040 | | | | |
| | Phe Tyr | Tyr Cys Ser Asp Gly | Tyr Ser Leu Ala Asp | Asn Ser Gln | | | | | |
| | 2045 | | 2050 | | 2055 | | | | |
| 30 | Leu Leu | Cys Asn Ala Gln Gly | Lys Trp Val Pro Pro | Glu Gly Gln | | | | | |
| | 2060 | | 2065 | | 2070 | | | | |
| | Asp Met | Pro Arg Cys Ile Ala | His Phe Cys Glu Lys | Pro Pro Ser | | | | | |
| | 2075 | | 2080 | | 2085 | | | | |
| | Val Ser | Tyr Ser Ile Leu Glu | Ser Val Ser Lys Ala | Lys Phe Ala | | | | | |
| 35 | 2090 | | 2095 | | 2100 | | | | |
| | Ala Gly | Ser Val Val Ser Phe | Lys Cys Met Glu Gly | Phe Val Leu | | | | | |
| | 2105 | | 2110 | | 2115 | | | | |
| | Asn Thr | Ser Ala Lys Ile Glu | Cys Met Arg Gly Gly | Gln Trp Asn | | | | | |
| | 2120 | | 2125 | | 2130 | | | | |
| 40 | Pro Ser | Pro Met Ser Ile Gln | Cys Ile Pro Val Arg | Cys Gly Glu | | | | | |
| | 2135 | | 2140 | | 2145 | | | | |
| | Pro Pro | Ser Ile Met Asn Gly | Tyr Ala Ser Gly Ser | Asn Tyr Ser | | | | | |
| | 2150 | | 2155 | | 2160 | | | | |
| | Phe Gly | Ala Met Val Ala Tyr | Ser Cys Asn Lys Gly | Phe Tyr Ile | | | | | |
| 45 | 2165 | | 2170 | | 2175 | | | | |
| | Lys Gly | Glu Lys Lys Ser Thr | Cys Glu Ala Thr Gly | Gln Trp Ser | | | | | |
| | 2180 | | 2185 | | 2190 | | | | |
| | Ser Pro | Ile Pro Thr Cys His | Pro Val Ser Cys Gly | Glu Pro Pro | | | | | |
| | 2195 | | 2200 | | 2205 | | | | |

5 Lys Val Glu Asn Gly Phe Leu Glu His Thr Thr Gly Arg Ile Phe
 2210 2215 2220
 Glu Ser Glu Val Arg Tyr Gln Cys Asn Pro Gly Tyr Lys Ser Val
 2225 2230 2235
 Gly Ser Pro Val Phe Val Cys Gln Ala Asn Arg His Trp His Ser
 10 2240 2245 2250
 Glu Ser Pro Leu Met Cys Val Pro Leu Asp Cys Gly Lys Pro Pro
 2255 2260 2265
 Pro Ile Gln Asn Gly Phe Met Lys Gly Glu Asn Phe Glu Val Gly
 2270 2275 2280
 15 Ser Lys Val Gln Phe Phe Cys Asn Glu Gly Tyr Glu Leu Val Gly
 2285 2290 2295
 Asp Ser Ser Trp Thr Cys Gln Lys Ser Gly Lys Trp Asn Lys Lys
 2300 2305 2310
 Ser Asn Pro Lys Cys Met Pro Ala Lys Cys Pro Glu Pro Pro Leu
 20 2315 2320 2325
 Leu Glu Asn Gln Leu Val Leu Lys Glu Leu Thr Thr Glu Val Gly
 2330 2335 2340
 Val Val Thr Phe Ser Cys Lys Glu Gly His Val Leu Gln Gly Pro
 2345 2350 2355
 25 Ser Val Leu Lys Cys Leu Pro Ser Gln Gln Trp Asn Asp Ser Phe
 2360 2365 2370
 Pro Val Cys Lys Ile Val Leu Cys Thr Pro Pro Pro Leu Ile Ser
 2375 2380 2385
 Phe Gly Val Pro Ile Pro Ser Ser Ala Leu His Phe Gly Ser Thr
 30 2390 2395 2400
 Val Lys Tyr Ser Cys Val Gly Gly Phe Phe Leu Arg Gly Asn Ser
 2405 2410 2415
 Thr Thr Leu Cys Gln Pro Asp Gly Thr Trp Ser Ser Pro Leu Pro
 2420 2425 2430
 35 Glu Cys Val Pro Val Glu Cys Pro Gln Pro Glu Glu Ile Pro Asn
 2435 2440 2445
 Gly Ile Ile Asp Val Gln Gly Leu Ala Tyr Leu Ser Thr Ala Leu
 2450 2455 2460
 Tyr Thr Cys Lys Pro Gly Phe Glu Leu Val Gly Asn Thr Thr Thr
 40 2465 2470 2475
 Leu Cys Gly Glu Asn Gly His Trp Leu Gly Gly Lys Pro Thr Cys
 2480 2485 2490
 Lys Ala Ile Glu Cys Leu Lys Pro Lys Glu Ile Leu Asn Gly Lys
 2495 2500 2505
 45 Phe Ser Tyr Thr Asp Leu His Tyr Gly Gln Thr Val Thr Tyr Ser
 2510 2515 2520
 Cys Asn Arg Gly Phe Arg Leu Glu Gly Pro Ser Ala Leu Thr Cys
 2525 2530 2535
 Leu Glu Thr Gly Asp Trp Asp Val Asp Ala Pro Ser Cys Asn Ala

5 Pro Asp Cys Val Pro Val Arg Cys Ala Thr Pro Pro Gln Leu Ala
 2885- 2890 2895
 Asn Gly Val Thr Glu Gly Leu Asp Tyr Gly Phe Met Lys Glu Val
 2900 2905 2910
 Thr Phe His Cys His Glu Gly Tyr Ile Leu His Gly Ala Pro Lys
 10 2915 2920 2925
 Leu Thr Cys Gln Ser Asp Gly Asn Trp Asp Ala Glu Ile Pro Leu
 2930 2935 2940
 Cys Lys Pro Val Asn Cys Gly Pro Pro Glu Asp Leu Ala His Gly
 2945 2950 2955
 15 Phe Pro Asn Gly Phe Ser Phe Ile His Gly Gly His Ile Gln Tyr
 2960 2965 2970
 Gln Cys Phe Pro Gly Tyr Lys Leu His Gly Asn Ser Ser Arg Arg
 2975 2980 2985
 Cys Leu Ser Asn Gly Ser Trp Ser Gly Ser Ser Pro Ser Cys Leu
 20 2990 2995 3000
 Pro Cys Arg Cys Ser Thr Pro Val Ile Glu Tyr Gly Thr Val Asn
 3005 3010 3015
 Gly Thr Asp Phe Asp Cys Gly Lys Ala Ala Arg Ile Gln Cys Phe
 3020 3025 3030
 25 Lys Gly Phe Lys Leu Leu Gly Leu Ser Glu Ile Thr Cys Glu Ala
 3035 3040 3045
 Asp Gly Gln Trp Ser Ser Gly Phe Pro His Cys Glu His Thr Ser
 3050 3055 3060
 Cys Gly Ser Leu Pro Met Ile Pro Asn Ala Phe Ile Ser Glu Thr
 30 3065 3070 3075
 Ser Ser Trp Lys Glu Asn Val Ile Thr Tyr Ser Cys Arg Ser Gly
 3080 3085 3090
 Tyr Val Ile Gln Gly Ser Ser Asp Leu Ile Cys Thr Glu Lys Gly
 3095 3100 3105
 35 Val Trp Ser Gln Pro Tyr Pro Val Cys Glu Pro Leu Ser Cys Gly
 3110 3115 3120
 Ser Pro Pro Ser Val Ala Asn Ala Val Ala Thr Gly Glu Ala His
 3125 3130 3135
 Thr Tyr Glu Ser Glu Val Lys Leu Arg Cys Leu Glu Gly Tyr Thr
 40 3140 3145 3150
 Met Asp Thr Asp Thr Asp Thr Phe Thr Cys Gln Lys Asp Gly Arg
 3155 3160 3165
 Trp Phe Pro Glu Arg Ile Ser Cys Ser Pro Lys Lys Cys Pro Leu
 3170 3175 3180
 45 Pro Glu Asn Ile Thr His Ile Leu Val His Gly Asp Asp Phe Ser
 3185 3190 3195
 Val Asn Arg Gln Val Ser Val Ser Cys Ala Glu Gly Tyr Thr Phe
 3200 3205 3210
 Glu Gly Val Asn Ile Ser Val Cys Gln Leu Asp Gly Thr Trp Glu

| | | | |
|----|---|------|------|
| 5 | 3215 | 3220 | 3225 |
| | Pro Pro Phe Ser Asp Glu Ser Cys Ser Pro Val Ser Cys Gly Lys | | |
| | 3230 | 3235 | 3240 |
| | Pro Glu Ser Pro Glu His Gly Phe Val Val Gly Ser Lys Tyr Thr | | |
| | 3245 | 3250 | 3255 |
| 10 | Phe Glu Ser Thr Ile Ile Tyr Gln Cys Glu Pro Gly Tyr Glu Leu | | |
| | 3260 | 3265 | 3270 |
| | Glu Gly Asn Arg Glu Arg Val Cys Gln Glu Asn Arg Gln Trp Ser | | |
| | 3275 | 3280 | 3285 |
| | Gly Gly Val Ala Ile Cys Lys Glu Thr Arg Cys Glu Thr Pro Leu | | |
| 15 | 3290 | 3295 | 3300 |
| | Glu Phe Leu Asn Gly Lys Ala Asp Ile Glu Asn Arg Thr Thr Gly | | |
| | 3305 | 3310 | 3315 |
| | Pro Asn Val Val Tyr Ser Cys Asn Arg Gly Tyr Ser Leu Glu Gly | | |
| | 3320 | 3325 | 3330 |
| 20 | Pro Ser Glu Ala His Cys Thr Glu Asn Gly Thr Trp Ser His Pro | | |
| | 3335 | 3340 | 3345 |
| | Val Pro Leu Cys Lys Pro Asn Pro Cys Pro Val Pro Phe Val Ile | | |
| | 3350 | 3355 | 3360 |
| | Pro Glu Asn Ala Leu Leu Ser Glu Lys Glu Phe Tyr Val Asp Gln | | |
| 25 | 3365 | 3370 | 3375 |
| | Asn Val Ser Ile Lys Cys Arg Glu Gly Phe Leu Leu Gln Gly His | | |
| | 3380 | 3385 | 3390 |
| | Gly Ile Ile Thr Cys Asn Pro Asp Glu Thr Trp Thr Gln Thr Ser | | |
| | 3395 | 3400 | 3405 |
| 30 | Ala Lys Cys Glu Lys Ile Ser Cys Gly Pro Pro Ala His Val Glu | | |
| | 3410 | 3415 | 3420 |
| | Asn Ala Ile Ala Arg Gly Val His Tyr Gln Tyr Gly Asp Met Ile | | |
| | 3425 | 3430 | 3435 |
| | Thr Tyr Ser Cys Tyr Ser Gly Tyr Met Leu Glu Gly Phe Leu Arg | | |
| 35 | 3440 | 3445 | 3450 |
| | Ser Val Cys Leu Glu Asn Gly Thr Trp Thr Ser Pro Pro Ile Cys | | |
| | 3455 | 3460 | 3465 |
| | Arg Ala Val Cys Arg Phe Pro Cys Gln Asn Gly Gly Ile Cys Gln | | |
| | 3470 | 3475 | 3480 |
| 40 | Arg Pro Asn Ala Cys Ser Cys Pro Glu Gly Trp Met Gly Arg Leu | | |
| | 3485 | 3490 | 3495 |
| | Cys Glu Glu Pro Ile Cys Ile Leu Pro Cys Leu Asn Gly Gly Arg | | |
| | 3500 | 3505 | 3510 |
| | Cys Val Ala Pro Tyr Gln Cys Asp Cys Pro Pro Gly Trp Thr Gly | | |
| 45 | 3515 | 3520 | 3525 |
| | Ser Arg Cys His Thr Ala Val Cys Gln Ser Pro Cys Leu Asn Gly | | |
| | 3530 | 3535 | 3540 |
| | Gly Lys Cys Val Arg Pro Asn Arg Cys His Cys Leu Ser Ser Trp | | |
| | 3545 | 3550 | 3555 |

5 Thr Gly His Asn Cys Ser Arg Lys Arg Arg Thr Gly Phe
3560 3565 3570

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